LITTLE BLUE PREHISTORY: ARCHAEOLOGICAL INVESTIGATIONS AT BLUE SPRINGS AND LONGVIEW LAKES, JACKSON COUNTY, MISSOURI

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An archeological investigation studied 34 sites located on lands designated for the construction of the Longview and Blue Springs Lakes, on the Little Blue River, in Jackson County, Missouri. The study was a combined National Register testing and data recovery mitigation program. The findings of the archeology provided insight into prehistoric occupation of the Kansas City area. Keywords.

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CHAPTER X

THE BOWLIN BRIDGE SITE (23JA38)

Robert R. Peterson, Jr.

INTRODUCTION

The Bowlin Bridge site was first reported by W. R. Wilson who recovered debitage, hammerstones and large corner-notched points from the site. It was also visited by Heffner (1974:12-13), who recovered a small sample of debitage from the surface. In 1976 the site was tested by crews from the University of Kansas and 17 one by two m test units were excavated on the site. Cultural material was reported to a depth of approximately 35 cm below the surface. Artifacts recovered included debitage, tools and pottery attributed to the Middle Woodland, Kansas City Hopewell (Brown 1977:45-50). One hearth, from which a sample of charred seeds was recovered, was found, but at that time no lithics, faunal remains or pottery were recovered in association with it. A summer and fall occupation was suggested by the recovery of charred seeds of bedstraw (Galium sp.) and pigweed (Amaranthus sp.) from the hearth and of dropseed (Sporobolus sp.) and sedge (Carex sp.) from another area of the site. Based on the results of the test excavations Brown (1977:30) recommended the site for Phase III data recovery investigations.

ENVIROMENTAL SETTING

Topography

Site 23JA38 is located on the T-1 terrace on the west side of the East Fork of the Little Blue River. It is in a cultivated field at the base of heavily wooded escarpment which rises approximately 15 m above the flood plain. The site covers about 24,000 sq m (6 acres) located within the loop of a channel scar which cuts across the cultivated field approximately 6 km south of the confluence with the main fork of the Little Blue River (Fig. 108). At this point the flood plain is approximately .5 km wide (Fig. 108).

The river valley was cut into Pennsylvanian age limestones and shales of the Pleasanton and Kansas City Groups. In the vicinity of 23JA38, the bluff tops are capped by the Winterset limestone formation and overlain by loess deposits. The escarpments, or bluff slopes, are formed in part by Bethany

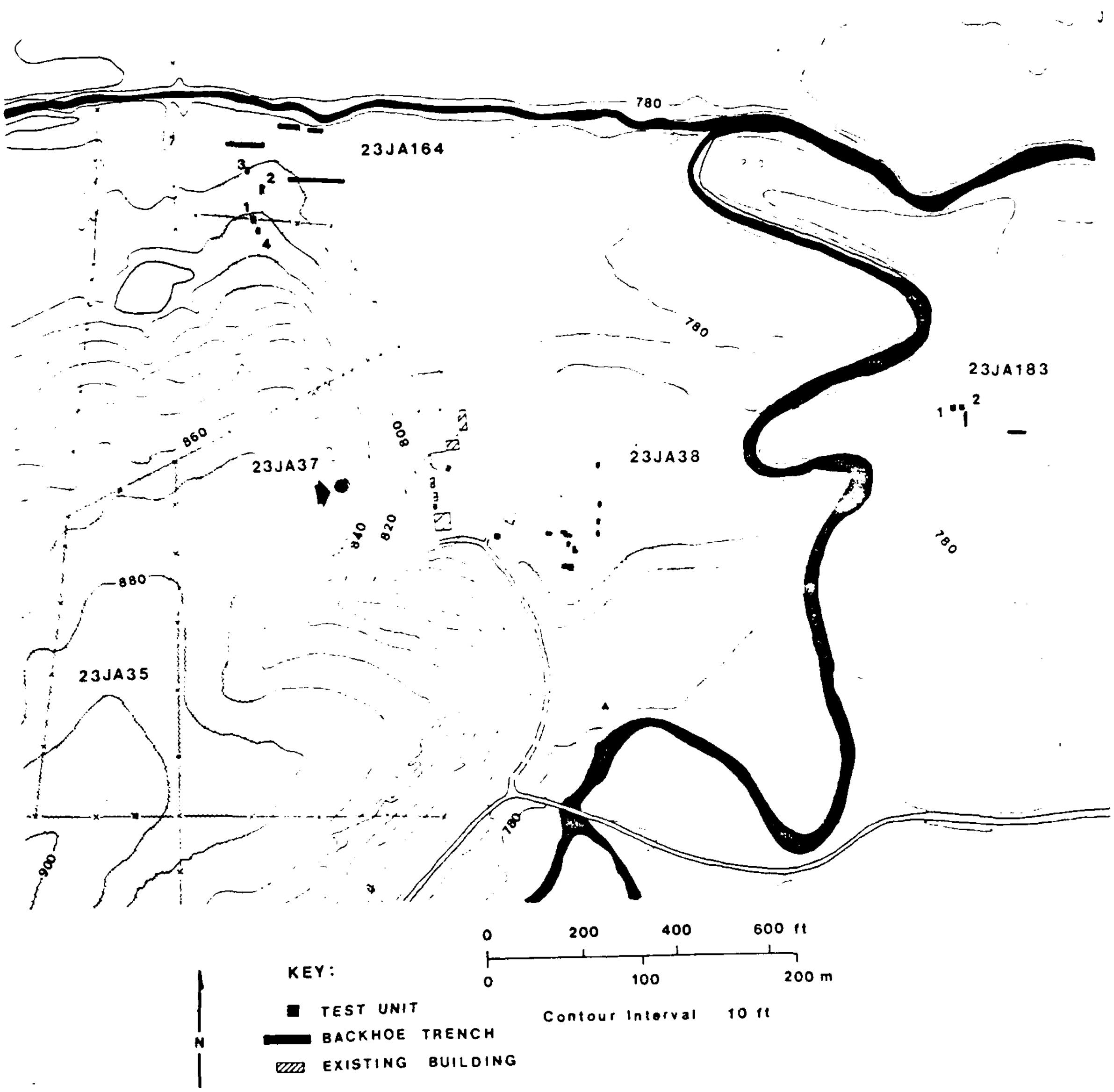

Figure 108. Location of 23JA38 and other nearby sites.

Falls limestone formation which is an extremely resiliant and prominent rock, six to seven m thick. The upper portion of this formation weathers out to form massive ledges and frequently includes overhangs where underlying shales and thinly bedded limestones have been eroded. A good example of this process is seen at Black Snake Shelter (23JA37) on the slope just west of the Bowlin Bridge site (Fig. 109).

Figure 109. Aerial view of the Bowlin Bridge site (23JA38).

Vegetation

U.S. Land Office Survey records for the early part of the nineteenth century indicate that the immediate area of 23JA38 was in a flood plain forest dominated by oak, elm, walnut and hickory with minor components of ash, boxelder and cottonwood. West of the site was a small area of barrens, or transition zone forest, also dominated by oak, hickory, elm, and walnut in more dispersed stands. Within a short distance of the site, one could reach all of the vegetative zones recorded for the Little Blue Valley (Jurney, this volume).

The flood plain forest was interspersed with areas of aquatic and lowland prairie vegetation which further increased the variety of floral species present in the immediate vicinity of the site. Plant foods available in the spring included rhizomes, shoots and tubers, stems leaves and some fruits. The fall produced seeds, fruits and nuts. Tubers, roots and rhizomes continued to be available during the winter months. The aquatic plant communities can sometimes include dense stands of edible plants such as cattails.

Animal populations in the flood plain forest and associated zones included whitetailed deer, turkey, passenger pigeon, squirrel, cottontail, raccoon, opossum and Black bear. Bison and wapiti were occasionally found here as well. Aquatic species included mussels, fish, frogs, turtles, beaver, otter and various species of wild fowl.

DESCRIPTION OF THE SITE AND INVESTIGATIONS

The 1979 excavations were directed toward the recovery of data pertaining to the subsistence strategy and cultural affiliation of the prehistoric inhabitants of the site. Based on Brown's excavations, cultural features were known to exist at the site and floral and faunal material was also known to be preserved in the deposits. The excavation strategy was designed toward the location and excavation of such features and recovery of associated cultural material.

Excavations took place in July and August of 1979. The field supervisor was Robert Peterson and the field crew consisted of Tom Dureka, Pat McCoy, Len Bates and Marsha Gonzales. Dave Saunders provided surveying assistance and Chuck Green and Dave Aubrey also worked on the site briefly.

When fieldwork commenced on 23JA38, the site was covered with a dense growth of grass and waist high weeds, mainly shepherds purse. A brush hog was used to clear the vegetation for a large area on the highest portion of the cultivated field in order to facilitate survey methods. North-south and east-west base lines were laid over the site using steel datum marker established by the University of Kansas (Brown 1977:46). This marker was used in 1976 as the vertical datum, but after settling or other disturbance it was utilized only as a horizontal datum in 1979. A new vertical datum was established on a telephone pole located near grid point 600N, 500E. This was adjacent to the main excavation and controlled vertical measurements during data recovery. The datum was assigned an arbitrary elevation of 0.0 m. All vertical measurements were recorded in both cm below ground surface and below datum. The site was excavated in 10 cm levels with reference to the ground surface. The grid was laid to match that utilized in 1976 as closely as possible. However, due to subsequent disturbances and the presence of only one reference point, it was not possible to establish the new grid closer than 80 cm east of the former north-south line.

A series of eight one by two m test units were excavated to test the distribution of subsurface material. Testing was concentrated in an area where University of Kansas investigations indicated the location of the largest amount of cultural material. This area was inside a loop formed by the old channel scars and also on the highest elevated area of the cultivated field. Only one unit revealed significant amounts of cultural debris below the surface. This test unit (480-481E 600N) is in the southern portion of the site on a small point extending southward into the channel scar. Subsequent excavation of a 15 sq m block (Block A) around this unit revealed a small concentration of lithic debris, tools and charcoal (Feature 1). Although there was not enough charcoal within the feature to obtain a radio-

carbon date, concentration of charcoal sufficiently large for dating was obtained from the same level within a second block located a meter to the west. The lithic concentration found in the block 20-40 cm levels below the surface was approximately 1.5 m in diameter. Only a light scatter of cultural material was recovered from the rest of the block.

In order to facilitate recovery of subsurface cultural features,a grader was used to cut two east-west transects across the site (Fig. 110). The upper 20-25 cm of soil, which roughly corresponds to the plow zone, was removed by the grader and the new surface was then shovel-scraped in order to reveal soil discolorations and artifact concentrations. The south transect, E463-496 N603-606, revealed one area with several irregular stains later determined to represent tree root casts (Fig. 111). The north transect, E470-520 N625-628, intersected one of the units placed in the site in 1976. This unit had produced a firepit with identifiable floral remains associated and it was hoped that additional cultural materials associated with this feature would be recovered. The firepit was relocated by the trenching and a concentration of lithic debris, tools and bone was uncovered one m east of the firepit at about the level that the top of the hearth was reported (Brown 1977:46). Feature 2 was also located in the north grader trench near its east end. This feature consists of a small cluster of burned limestone cobbles which appear to represent a hearth debris. Block C was a small 4 sq m unit placed in the area adjacent to the 1976 test which had produced a few ceramics. This block revealed the presence of a concentration of bones and ceramics in the 25-50 cm below surface (Feature 5).

Initially, soil samples were systematically screened through ¼ mesh at Block A and the first three test units. It was later determined that artifact recovery by hand troweling and thin shovel scraping was more expedient in terms of artifact yield and time expenditures. Therefore, screens were not used during the excavation of Blocks B and C. Selected soil samples from the excavation units were collected for water screening and flotation recovery at the laboratory. This procedure yields samples of minute flora, fauna, and lithics.

Stratigraphy

Site 23JA38 is located on a remnant T-1 terrace within a loop formed by an old channel scar. The area within this loop is slightly higher in elevation than those outside it in the same cultivated field. The loop is probably a cutoff channel influenced by tributary stream action.

The site is located within the Zook-Colo soil association. These soils are generally characterized as poorly drained and fine textured and as having formed in alluvium in flood plains. Zook soils were formed under prairie vegetation. Portions of the T-0 terrace are extant along the margins of the site on the bank of the Little Blue. This terrace (formed by Kennebec soils) is approximately 2 m lower than T-1.

Figure 112 illustrates the distribution of soils and artifacts from the three excavation blocks. The upper cultivation zone (Unit II) is a smooth textured, dark grayish brown (10YR 3/2) silt loam approximately 25 cm in

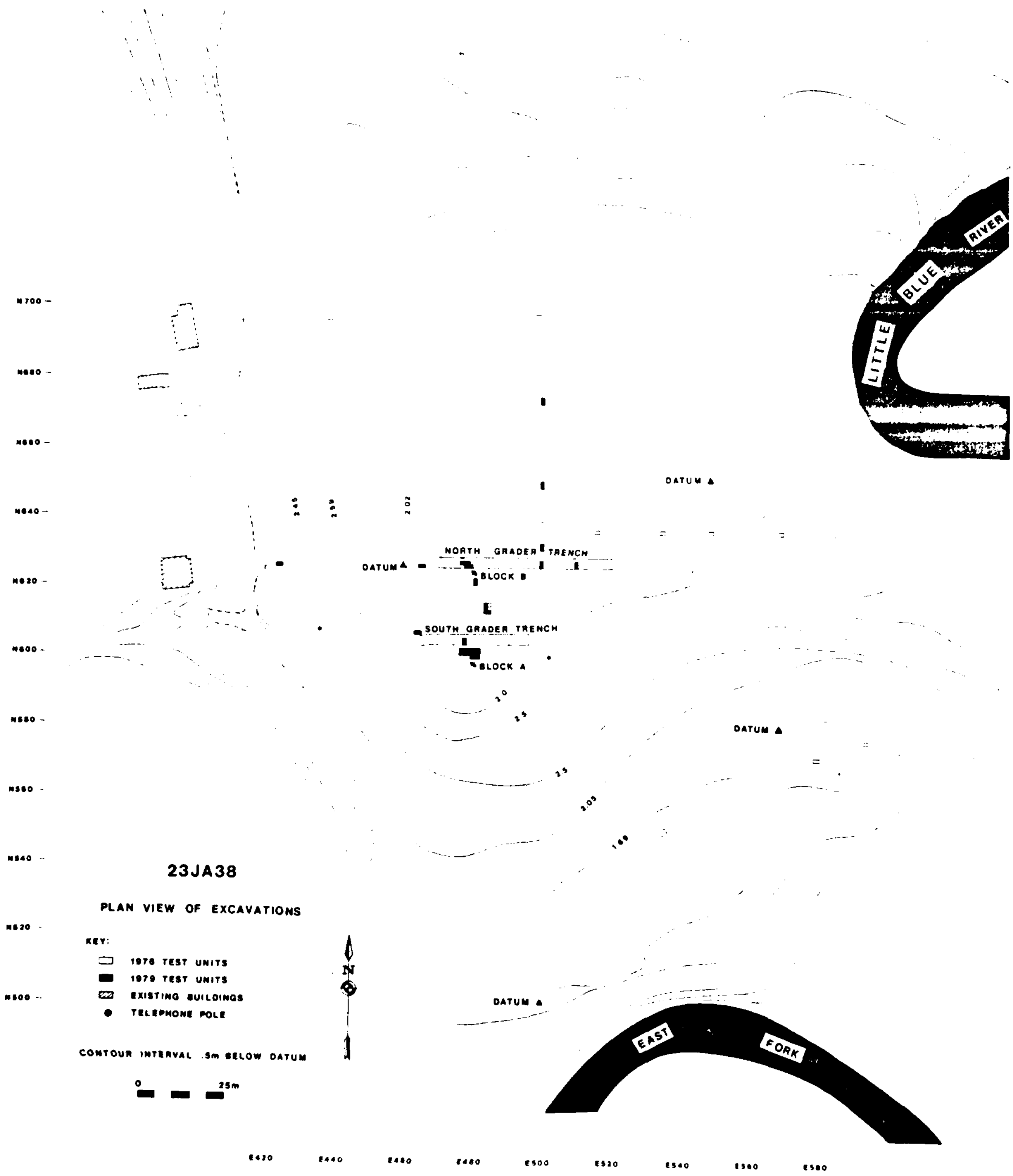

Figure 110. Plan view of excavations at 23JA238.

Figure 111. General views of excavations at 23JA38. South grader trench (upper) and Feature 2 (lower).

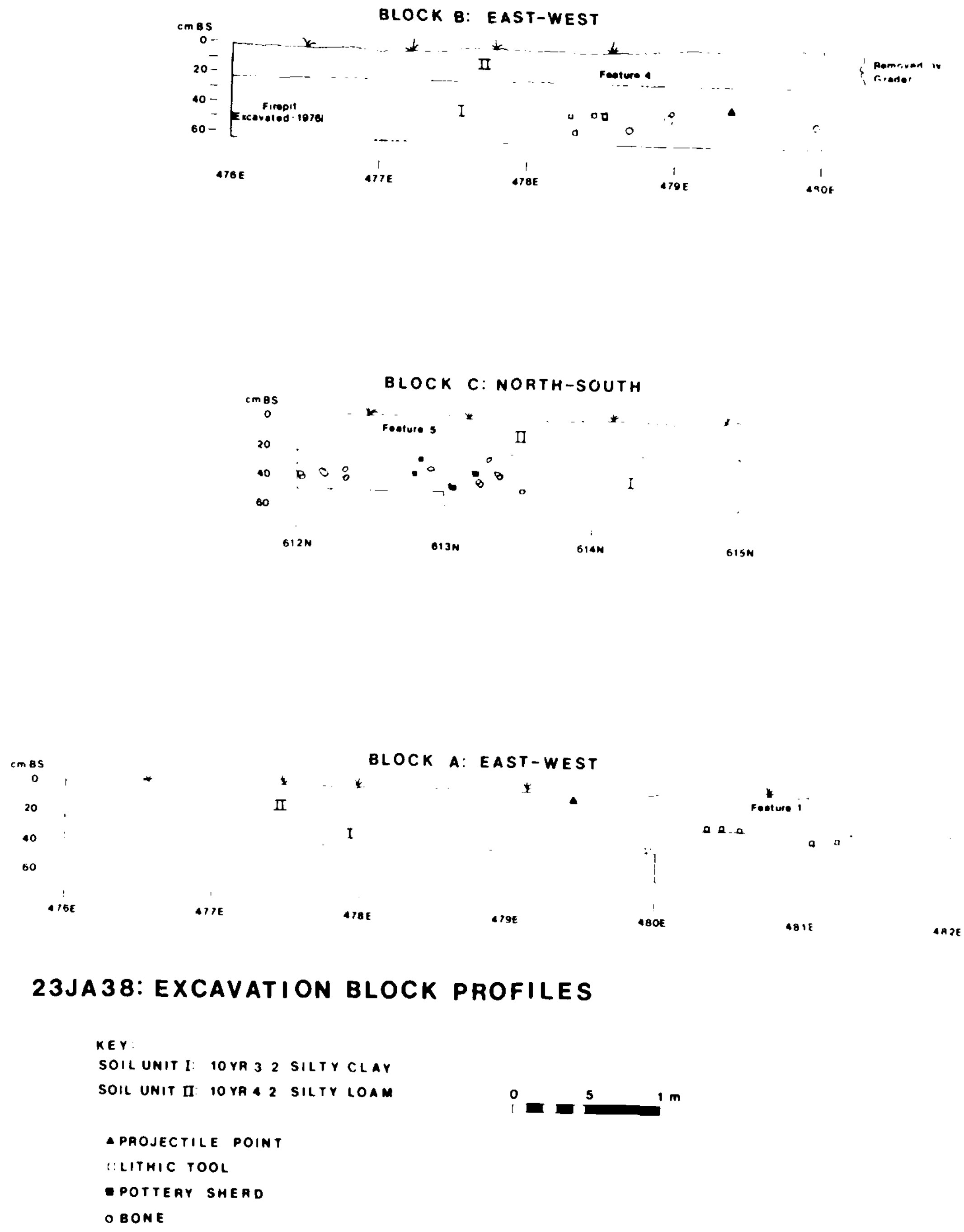

Figure 112. Profiles of block excavations at 23JA38.

depth. Below this was Unit I, a very dark gray (10YR 3/2) silty clay with a blocky soil structure and fewer organics than the cultivation zone. Unit I extended to a depth of at least 80 cm, becoming more blocky with depth in some units.

Cultural material was recovered to a depth of 60 cm, although the majority of materials came from the 20-50 cm below the surface.

In Block B, the cultural deposit occurred about 15 cm lower below ground surface than the deposit recovered in Blocks A and C (Fig. 112). All deposits, however, were approximately at the same depth below datum.

Radiocarbon Dates

One radiocarbon sample was recovered from the site. It is a relatively large sample (11.7 g) of wood charcoal from a small concentration in Block A just west of Feature 1. It is from Unit N479, N600 30-40 cm below the surface (1.72-1.82 below datum.) A date of 2440±90 B.P. (Beta-1326), or 490 years B.C., was obtained from this sample. This sample is not associated with the ceramics or other culturally diagnostic material.

CULTURAL FEATURES

Five cultural features were recognized at 23JA38. Four of these were concentrations of lithics, bone and ceramics. The other feature was a small concentration of burnt limestone. These five features yielded the bulk of the cultural material recovered from the excavations. The artifact density in the intervening area was extremely low, 11.4 artifacts per cubic m in the test units, as compared to Feature 4 which had a density of over 160 artifacts per cubic m.

Each feature was in approximately the same vertical position in the profile, but exhibited differences in content. The features were defined on the basis of quantitative and qualitative characteristics of the artifact assemblage which became apparent as the materials were mapped and examined in relation to the rest of the excavation area. Figure 113 shows the block excavations and features.

Feature 1: Feature 1 was encountered during the initial testing phase of the 1979 excavations and consisted of a concentration of lithic debris, a small charcoal stain, and a small lens of burnt sediment and charcoal (Fig. 113). It is located at the east end of Block A and is largely continued to three one by one m units. Within the center of the lithic concentration was a small cohesive distribution of chipped-stone consisting of 13 flakes and one core of Winterset chert, approximately 25 cm below the surface. One of the flakes from the concentration can be reconstructed on the core. The majority of the lithic concentration was located 20-40 cm below surface. Some burnt earth and charcoal flecks occurred throughout the area of lithic concentration and in a small lens in 479E, 600N, but there was not enough present for dating the feature. Adjacent units yielded a relatively light deposit of cultural

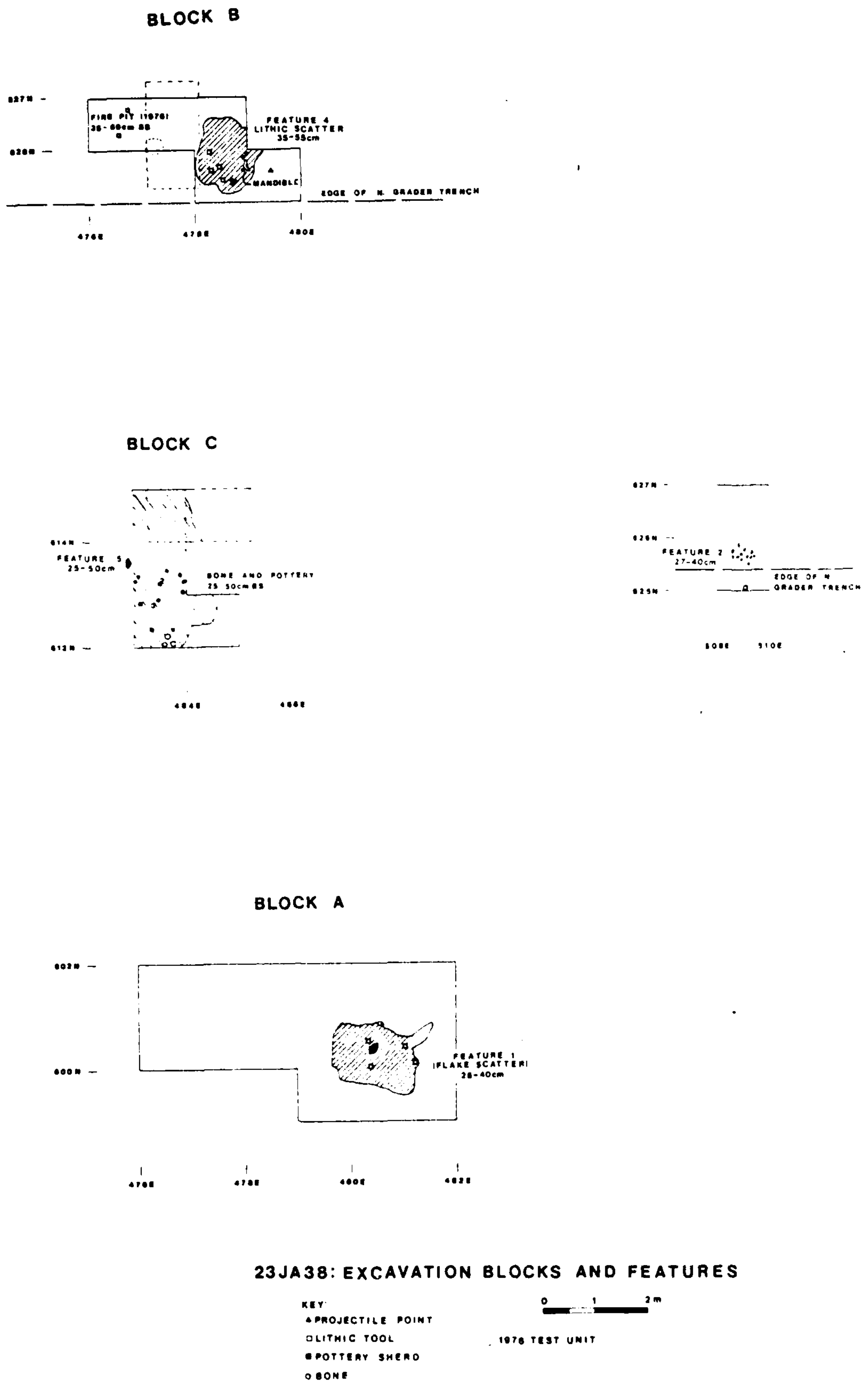

Figure 113. Plan view of excavation blocks and features at 23JA38.

material. No faunal or floral remains or ceramics were recovered in Feature 1. Additional lithic debris from the feature consisted of over 150 flakes of the local Winterset chert, six biface fragments, a core and 14 edge-modified flakes. Flotation samples from this area also included a quantity of minute secondary flakes. A relatively dense concentration of such flakes was recovered from 20-30 cm level of Unit 480E 599N, in the lithic concentration.

Feature 1 is, of course, related to chipped-stone tool production as indicated by flake by-products, broken bifacially-chipped artifacts and amorphous cores. In addition the presence of utilized flakes and scrapers may point to tool usage. That this concentration of lithics represents in situ production and processing is a debatable inference since redistributive behavior of waste, chipped-stone rejectage and tools has been recorded ethnographically (Yellen 1977) and in the archaeological record (Leroi-Gourhan 1972).

Feature 2: Feature 2 was located during the grader trenching operation and consisted of a small concentration of burnt limestone cobbles (Fig. 113). Twelve fire reddened cobbles were recovered in an area approximately 30 by 40 cm and about 27 cm below the surface. Other such cobbles were scattered nearby at the same level. The feature may have been somewhat disturbed by the grader, but it did not appear to have been displaced significantly. Soil discolorations were not associated with the cobbles. Waterscreening of their matrix recovered only a few minute fragments of charcoal. This procedure also recovered a number of tiny tool sharpening or use flakes.

Given the absence of scorched soil, charcoal and ash, Feature 2 does not likely represent in situ thermogenesis although reddened surfaces of the cobbles indicate such a process. It is possible that the cobbles represent relocated remnants of either an open fire hearth or a hot-rock oven.

Feature 3: Feature 3 was a cluster of irregular stains uncovered at the base of the plow zone by the grader trenching operation. Located in the south grader trench they appeared as irregular areas of grayish soil surrounded by orange rings. Examination of profiles indicated that they are most likely tree root casts. Shovel scraping of areas nearby in the trench revealed the presence of similar horizontally aligned features. They may represent fire-felled vegetation since they contained occasional small flecks of charcoal and burnt earth.

Feature 4: This feature consisted of a concentration of chipped-stone debitage, tools and bone located one m east of the firepit and at approximately the same depth of the firepit recorded by Brown (1977:46). Among the bones recovered from this area was the nearly complete mandible of a bison and fragments of burnt and unburnt bone from smaller game. Lithics included two projectile point tips, a biface fragment and ten edge-modified flakes as well as moderately heavy scatter of lithics. Flotation and waterscreening of soil yielded minute tool sharpening or utilization flakes, less than 5 mm in maximum dimension.

The feature also exhibited a relatively high proportion of non-Winterset flakes. White, pink or brown "non-local" chert accounted for 13 percent of raw-material types as opposed to 1 percent and 3 percent from Features 1 and 5, respectively. Since white, pink and "non-local" brown cherts are repre-

sented among the tools, it is suggested that artifacts from which they derived were more specialized (eg. bifacial knives, endscrapers) and may represent secondary-retouch flakes.

Flotation and waterscreening of matrix yielded fragments of charred nut and seeds. They have been identified as hickory and black walnut.

Materials from Feature 4 are related to food processing, tool discard and manufacture. The close spatial association of "kitchen" remains, chipped-stone debitage, tools and tool fragments is not uncommon for Kansas City area sites. These remains may be disposed of intentionally in trash-filled storage pits (Bell 1976) and/or allowed to lay on the ground surface either as primary or secondary cultural deposits, in which case they represent a "midden". Middens of varying density and size often occur adjacent to hearths or fire-pits because, as noted by Yellen: "The hearth is not only a source of warmth in winter, of light at night, and of energy for cooking; it serves also as a focus for the nuclear family. The general concentration of nutshell, bones, and other remains around it indicate the numerous activities that occur in its immediate environs." (1977:143).

As stated above, Feature 4 is within 1 m of the firepit recorded by Brown (1977) and, therefore, should not be categorized in terms of specialized or single activities. Further, it is an ad hoc feature for the purpose of delineating a small midden deposit.

Feature 5: Feature 5 is primarily a concentration of bone and ceramics in Block C (483-485E, 612-614N), about 25-50 cm below surface. The feature yielded 194 bone fragments, 35 ceramic sherds, a number of fragments of charred nut and charred seeds and light scatter of lithic debitage. The material was concentrated mainly in three one by one m units (Fig. 113). The bone was mostly concentrated in the south half of the block, although ceramic sherds were scattered throughout the area. The total size of the feature extended beyond the limits of block excavation. According to horizontal grid determinations, the 1979 excavations overlapped slightly with a unit dug in 1976.

Ceramics from this area in 1976 and 1979 were cord-marked rim and body sherds and may represent sections of the same vessel. Some of them exhibit blackened exterior surfaces, indicating use as cooking pots. Much of the bone was unidentifiable due to intense fragmentation. One mandible of bison and fragments of teeth were recognized. The burnt bone consists of very tiny fragments and may be the result of marrow extraction or bone grease processing activities. The lithic density was slightly higher than that in the surrounding areas. Only one tool (an edge-modified flake) was recovered from this block.

Waterscreening and flotation of soil from this area recovered a number of charred and uncharred seeds and fragments of charred nut as well as tiny tool sharpening and use flakes. The density of the small lithics is higher in the southern portion of the block where most of the bone was also found.

Feature 5 is another ad hoc "midden" feature as is Feature 4. They have in common many of the same artifact types and neither appear to be directly

related to pit disposal. By contrast, this midden is larger, more dispersed and, in terms of content, is distinguished by the presence of ceramic sherds.

ARTIFACT ASSEMBLAGE

A total of 1748 prehistoric and historic cultural items were recovered during test investigations. These include worked and unworked stone, ceramics and faunal remains. (Not included in this total are a quantity of charred and uncharred seeds, fragments of charred nutshell and a number of minute flakes also recovered from the flotation and waterscreening.) The distribution of this material is shown in Tables 50 and 51 and has been broken down by cultural components represented at the site.

Ceramics

Thirty-three ceramic sherds were recovered from 23JA38 during the 1976 and 1979 test investigations (Tables 52 and 53). All sherds came from the area of Block C and are homogeneous in form, surface treatment, temper and thickness. The fragments are badly weathered and, for many specimens, it is not possible to determine surface treatment and sherd thickness. Only nine sherds are sufficiently complete to furnish reliable thickness measurements. In order to obtain a more meaningful sample of material, ceramics recovered by SSI's excavations in 1979 and the material from the 1976 University of Kansas excavations are discussed together.

<u>Cord-Marked</u> <u>Rimsherds</u> (n=1)

The testing in 1976 recovered one ceramic rimsherd from the area of Block C (Fig. 114a). The rim is slightly everted with a smooth, rounded lip. The exterior surface is vertically cord-marked all the way to the lip. The cord marking appears to have been applied after the formation of the lip, as it extends up into the lip with no evidence of smoothing. The interior surface of the sherd is smooth and blackened, and this condition extends irregularly over the lip and onto the exterior surface for several mm. The specimen is sherd-tempered and the interior paste is dark gray in color. Its thickness is 6 mm.

<u>Cord-Marked</u> <u>Body Sherds</u> (n=15)

The cord markings are vertically oriented and irregularly spaced and occasionally overlap (Fig. 114b-e). Due to surficial erosion it is not possible to identify the method of application or the type of twist utilized.

The exterior surface color varies from gray or brown (10YR3/2, 10YR4/2) to light orange (7.5YR6/6) with intergrades between these colors on some sherds. Four of the body sherds exhibit blackening or charring on their interior surfaces. The interior paste is generally a dark gray (10YR3/1) with some lighter mottling. A number of small ferrous inclusions appear as reddish brown spots or flecks. These appear to be natural paste inclusions.

Table 50. Distribution of cultural material in the Woodland component (Block A) and the test units at 23JA38.

	BLOCK A						TEST UNITS						TOTAL
	0-10	10-20	20-30	30-40	40-50	50-60	0-10	10-20	20-30	30-40	40-50	50-60	
CERAMICS													
CHIPPED STONE TOOLS													
Projectile Points	1			1							1		3
Bifacial Knives		1										1	2
Bifacial Scrapers			2	1									3
Bifacial Blanks				1									1
Biface Fragments			1										1
Edge-modified Flakes			12	5	1		1	1		2	1		23
Total	1	1	15	8	1		1	1		2	2	1	33
MANUFACTURING DEBRIS													
Cores			1	1						2			4
Flakes	17	9	137	95	11	1	1	3	5	24	3	1	307
Chunk			1										1
Shatter			3	1									4
Total	17	9	142	97	11	1	1	3	5	26	3	1	316
MINERAL												1	1
HEARTHSTONE										29			29
UNWORKED BONE	1	1											2
CHARRED NUT										6			6
CHARRED SEEDS										9			9
UNWORKED STONE	8	5	6	3	2		12	10	6	6	4		62
HISTORIC	2	6	1				7	13	24	12	7		72
TOTAL	29	22	164	108	14	1	21	27	35	90	16	3	530

Table 51. Distribution of cultural material in the May Brook component at 23JA38.

	BLOCK B				BLOCK C				TOTAL	SITE TOTAL
	24-34	34-44	44-54	54-64	20-30	30-40	40-50	50-60		
CERAMICS					3	5	5	2	15	15
CHIPPED STONE TOOLS										
Projectile Points			1	1					2	5
Bifacial Knives										2
Bifacial Scrapers										3
Bifacial Blanks										1
Biface Fragments				1					1	2
Edge-Modified flakes	3	2	5		1				11	34
Total	3	2	6	2	1				14	47
MANUFACTURING DEBRIS										
Cores										4
Flakes	13	26	147	21	8	10	12		237	544
Chunk										1
Shatter				1					1	5
Total	13	26	147	22	8	10	12		238	554
MINERAL		1							1	2
HEARTHSTONE										29
UNWORKED BONE		4	2	1	6	47	139	2	201	203
CHARRED NUT		3	3	1		5	10		22	28
CHARRED SEEDS		2	63	46		1	50	18	180	189
UNWORKED STONE		3	12	2					17	79
HISTORIC										72
TOTAL	16	41	233	74	18	68	216	22	688	1218

Table 52. Ceramics recovered from the Bowlin Bridge site (23JA38).

CATALOG NUMBER	PROVENIENCE	DEPTH BELOW SURFACE	SURFACE TREATMENT	COLOR	CHARCOAL INTERIOR	TEMPER	LENGTH (mm)	WIDTH (mm)	THICKNESS (mm)	LIP	DECORATION
1976 Excavations											
A01842-1	E484N614	30-40	Cord marked	Tan	+	Sherd	49	21	6	Smooth Rounded	--
1979 Excavations											
229	E483.14N612.82	28	Cord marked	Orange	+	Sherd	53		39	9-10	
235	E483.37N612.80	39	Cord marked	Tan	?	Sherd	35		23	--	
254-1	E483N603	30-40	Cord marked	Tan	?	Sherd	24		13	--	
254-2	E483N613	30-40	Cord marked	Orange	-	Sherd	33		23	7	
254-3	E483N613	30-40	---	---	?	Sherd	23		14	--	
157-1	E483N613	40-50	---	---	-	Sherd	12		6	--	
257-2	E483N613	40-50	Cord marked	Tan	-	Sherd	26		15	8	
257-3	E493N613	40-50	---	---	+	Sherd	33		20	--	
257-4	E483N613	40-50	Cord marked	Tan	?	Sherd	21		16	--	
257-5	E483N613	40-50	Cord marked	Gray	-	Sherd	65		42	6-10	
246-1	E483N613	20-30	---	---	?	Sherd	15		12	--	
246-2	E483N613	20-30	---	---	?	Sherd	18		9	--	
264-1	E483N613	50-60	---	---	?	Sherd	15		10	--	
264-2	E483N613	50-60	---	---	?	Sherd	12		6	--	

(continued)

Table 53. Body sherds recovered from Bowlin Bridge site (23JA38).

CATALOG NUMBER	PROVENIENCE	DEPTH BELOW SURFACE	SURFACE TREATMENT	COLOR	CHARCOAL INTERIOR	TEMPER	LENGTH (mm)	WIDTH (mm)	THICKNESS (mm)
1976 Excavations									
A01836-1	E484N614	20-30	Cord marked	Gray	?	Sherd	16	10	--
A01836-2	E484N614	20-30	Cord marked	--	?	Sherd	21	12	--
A01836-3	E484N614	20-30	Cord marked	Gray	?	Sherd	18	14	--
A01836-4	E434N614	20-30	----	Tan	?	Sherd	22	21	--
A01837	E434.58N614.23	27	Cord marked	Tan	+	Sherd	52	34	7-10
A01838-1	E484.95N614.63	24	Cord marked	Gray	?	Sherd	18	16	--
A01838-2	E484.95N614.63	24	----	--	?	Sherd	19	14	--
A01839-1	E484.74N614.78	30	Cord marked	Orange	?	Sherd	30	20	--
A01839-2	E484.74N614.78	30	----	--	?	--	12	10	--
A01839-3	E484.74N614.78	30	Cord marked	Orange	?	Sherd	13	9	--
A01839-4	E484.74N614.78	30	----	--	?	--	--	--	--
A01839-5	E484.74N614.78	30	----	--	?	--	--	--	--
A01840-1	E484.63N614.29	29	----	Gray	-	Sherd	22	20	9
A01840-2	E484.63N614.29	29	----	Orange	-	Sherd	22	20	9
A01840-3	E484.63N614.29	29	----	--	?	Sherd	12	8	--
A0184904	E484.63N614.29	29	----	--	?	Sherd	10	8	--
A01843	E484.65N614.04	34	Cord marked	Tan	+	Sherd	60	44	8
A01842	E484N614	30-40	----	--	?	Sherd	13	11	--

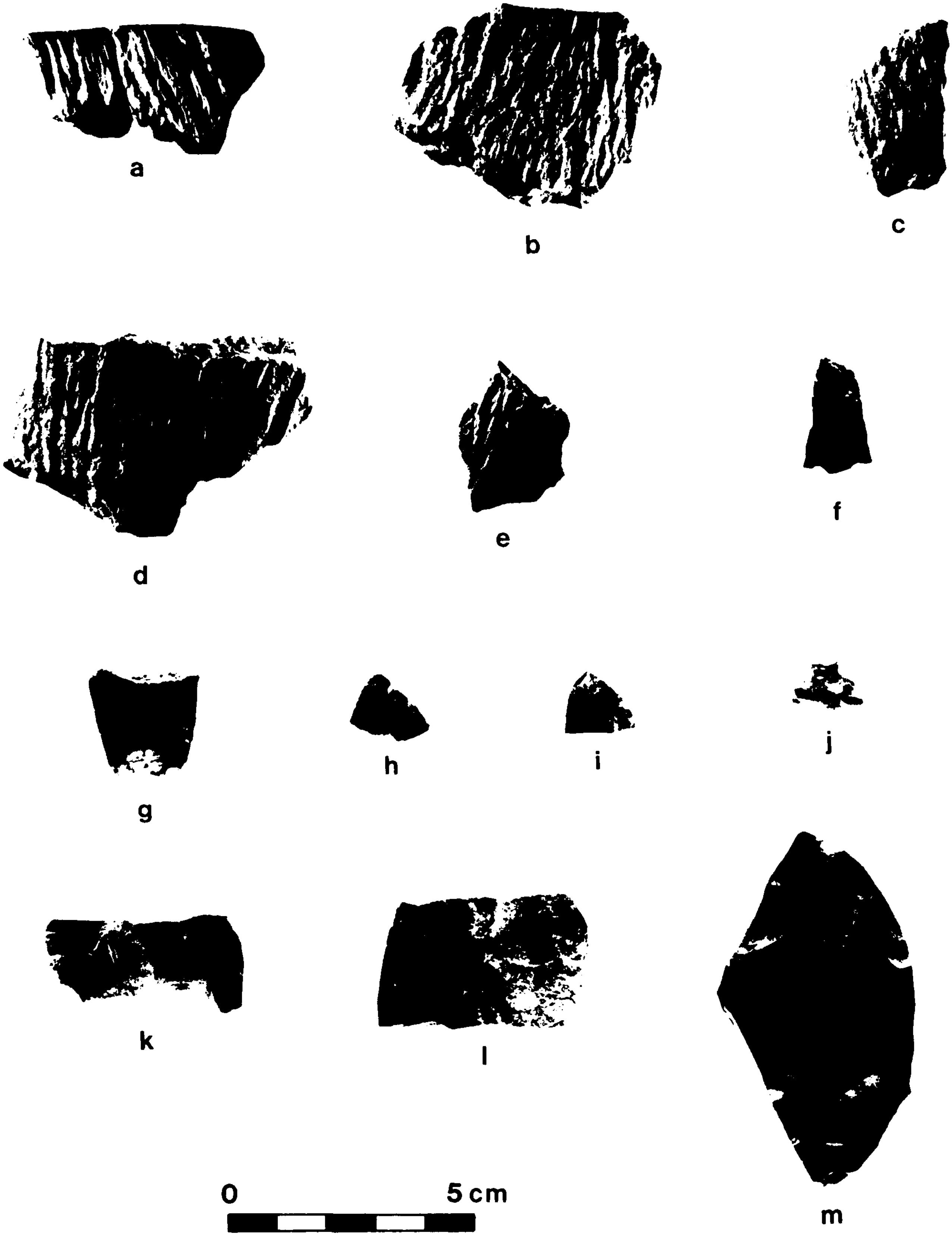

Figure 114. Ceramics and bifacial tools from 23JA38: (a) cordmarked rimsherd, (b-c) cordmarked body sherds, (f-j) projectile point fragments, (k-l) bifacial knives, (m) bifacial scraper.

The temper consists of angular fragments of fired clay and accounts for less than 10 percent of the sherd's matrix. They range in size from 0.5-3 mm and are generally a light tan (10YR7/3 or 10YR7/4) in color. Temper is not visible within them, but their angular nature indicates that they are probably crushed sherds. Some exhibit ferrous inclusions. They are approximately the same hardness as the surrounding paste.

Sherd thickness ranges from 6-10 mm but the majority of the specimens could not be measured, due to exfoliation of surfaces.

Miscellaneous Sherds (n=17)

These include fragments which were subjected to extensive surficial exfoliation. Although surface treatments and thickness cannot be determined, temper, color and paste are identical to the better preserved specimens.

Chipped Stone Tools

The chipped stone tool collection consisted of projectile bifaces and edge-modified flakes. Most of these are made from the local Winterset chert, but there are also examples, particularly among the bifacial tools, of some non-local cherts.

Bifacial Tools

Bifacial tools from Bowlin Bridge comprised 26 percent of the lithic tool inventory from the 1979 excavations (Table 54). They include projectile points, bifacial knives and scrapers and bifacial blanks. All except two of the projectile points are made of local Winterset chert.

Projectile Points (n=5)

This series of artifacts consists of one proximal (basal), one medial and three distal (tip) sections of broken projectile points. The medial section, made from Winterset, was snapped just below the juncture of the blade and stem and, by extrapolation, appears to have been corner notched. Its distal fracture plane is smooth and was probably caused by impact (Fig. 114f). This specimen is similar to Late Middle Woodland (Kansas City Hopewell) and Late Woodland forms (Heffner 1974; Bell 1976).

The basal section consists of a contracting stem with a lenticular cross-section and basal thinning. It was made from white, probably non-local chert. Contracting stem configurations of this type are seen throughout the local Woodland period, particularly in the Early and Middle periods (Bell 1976; Brockington 1978; Wright 1980).

The three distal sections ranged from 13-16 mm in length and all were 5 mm thick and were broken either during use or manufacture. Their size indicates that they were part of medium-sized dart points, somewhat larger than the medial section described above (Fig. 114h-j). Two were made from Winterset and the third was made from a non-local pink chert.

Table 54 . Bifacial tools from 23JA38.

CATALOG NUMBER	TYPE	PROVENIENCE	DEPTH BELOW SURFACE	MATERIAL TYPE	LENGTH (mm)	WIDTH (mm)	THICKNESS (mm)	WEIGHT (g)
19779	Projectile pt. base	478.32E625.89N	SS	White exotic	-	-	07	-
11679	Projectile pt. midsection	479.21E600.50N	06	Winterset	-	14	03	-
9479	Projectile pt. tip	479.49E625.68N	46	Winterset	-	-	05	-
13879	Projectile pt. tip	479E 625N	54-65	Winterset	-	-	05	-
14779	Projectile pt. tip	480E 599N	30-40	Pink exotic	-	-	05	-
7779	Biface knife midsection	478.68E600.21N	19	Winterset	-	40	05	-
20079	Biface knife midsection	480.78E621.97N	55	Winterset	-	44	10	-
12279	Biface scraper	479.04E600.16N	23	Winterset	-	26	10	-
21479	Biface scraper	481.07E600.43N	31	Winterset	72	40	16	38.1
22379	Biface scraper	481.21E600.14N	30	Winterset	-	33	13	-
21379	Biface scraper	481E 600N	30-40	Winterset	78	39	21	69.9
9979	Biface fragment	478.32E625.89N	SS	Winterset	-	-	-	-
14479	Biface fragment	480E 599N	20-30	Winterset	-	-	-	-

Bifacial Knives (n=2)

These are both midsections of thin bifaces with lenticular cross sections and shallow angled working edges. Both exhibit some evidence of attrition wear on the working edges. They are both of blue gray Winterset chert (Fig. 114k-l).

Biface Scrapers (n=4)

This series of artifacts includes complete bifaces or biface fragments with scraping wear patterns on one or more margins. The largest of these is a thick-sectioned bifacial fragment (Fig. 114m). It was utilized as a scraper with three edges exhibiting unidirectional attrition and step fracturing along the margins. These working edges measured from 23-37 mm in length while the total length of the tool was 72 mm. It is made of dark gray Winterset chert. Two of the other scrapers are irregular biface fragments with two working edges exhibiting unidirectional attrition and step fracture (Fig. 115a-b). Both appear to be broken biface blanks which have been reutilized as scraping tools. They are both made of blue gray Winterset chert. The fourth is an elongate, roughly worked tabular biface with one edge which exhibits unidirectional attrition and step fracture.

Biface Fragments (n=2)

Both of these are small, irregular bifacial edge fragments. They are both of Winterset chert and both exhibit some marginal retouch.

Bifacial Tools from the University of Kansas Collection

Bifacial tools from the 1976 excavations include a midsection of a large dart point of white exotic chert, the base of a small biface of pink exotic chert and a bifacially flaked Winterset chert tabloid which was utilized as a scraper. There is also one thin, straight-based lanceolate of gray banded Winterset (Fig. 115d). A similar tool was recovered from the May Brook phase occupation at 23JA238, about 1.5 km to the southeast.

Marginally Retouched Tools

This category of tools is made up of flakes with one or more utilized or retouched edges and one large retouched tabloid (Table 55).

Edge-Modified Flakes (n=33)

A total of 33 edge-modified flakes were recovered from the excavations (Table 55). These made up 74 percent of the lithic tool inventory from the excavations. These 33 flake tools had a total of 39 worked edges, including eight projections. Of the latter, six were reworked or shaped into the projection and two were simple fortuitous projections which may have been used as graving or perforating tools. Two of the tools have shallow concave working edges. The majority (94 percent) of the edge-modified flakes exhibited straight or slightly excurvate working edges. The mean length of these edges was 11.34 mm and 20 (69 percent) of the 29 exhibited step fracturing. These appear to have been utilized as scraping tools on relatively hard substances such as wood, bone or antler (Chapman 1977). The length of the working edges and their position on the flakes generally indicates that they were not utilized for working on flat surfaces such as a hide but rather on

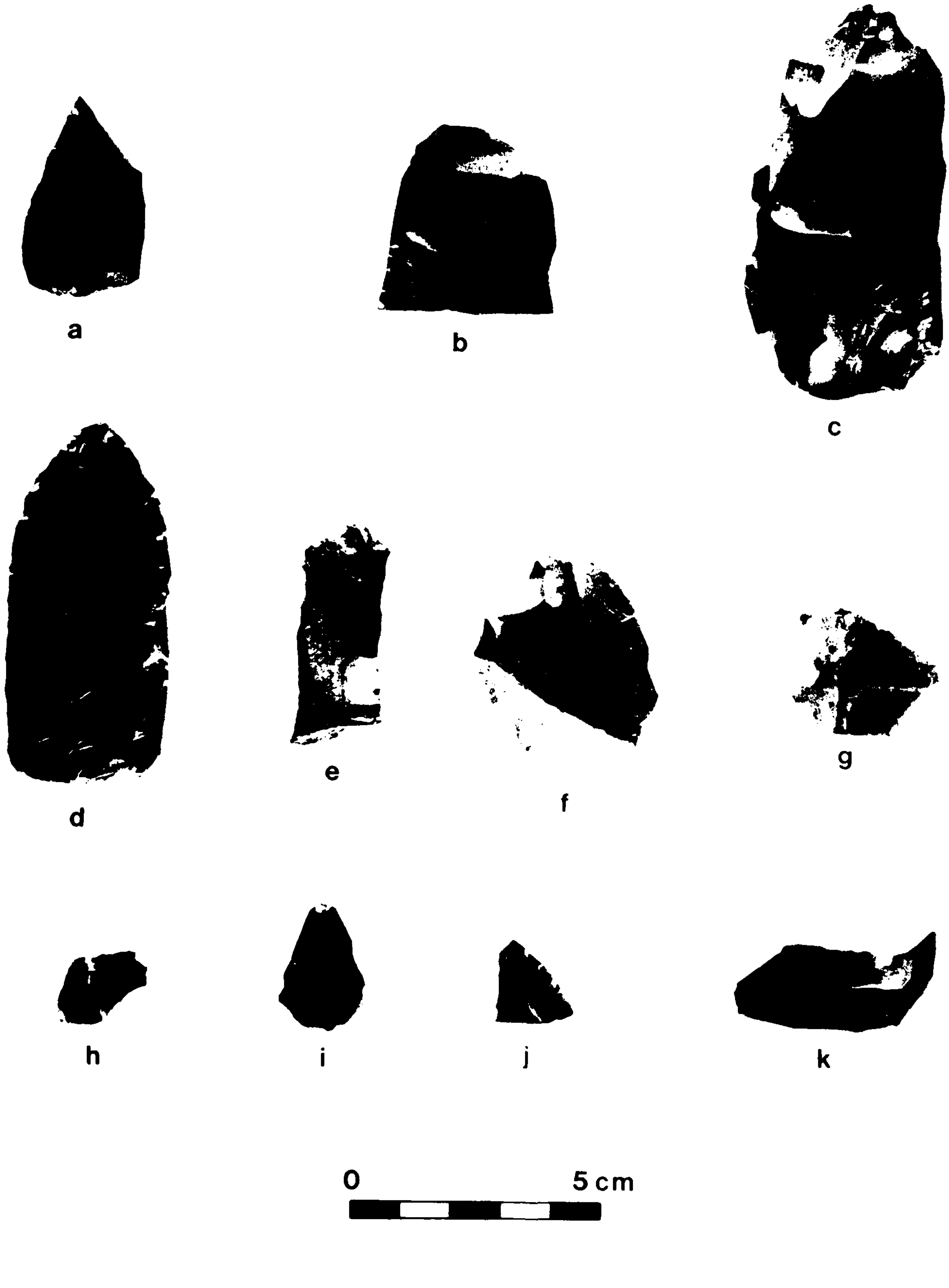

Figure 115. Bifaces and edge-modified flakes from 23JA38: (a-c) biface scrapers, (d) biface knife from 1976 excavations, (e-k) edge-modified flakes.

Table 55. Descriptive data for the edge-modified flakes recovered from 23JA38.
Page 1

CATALOG NUMBER	PROVENIENCE	DEPTH Below Surface	MATERIAL TYPE*	EDGE SHAPE AND WEAR** Convex-Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (mm) Length	Width	Thickness
BLOCK A										
112	E479 N599	20-30	BWS	1A		-	3.1	32	24	04
121	E479 N600	20-30	BWS	1A		-	1.3	25	13	05
143	E480 N599	20-30	BWS	1S		-	.7	20	12	03
148-1	E480 N599	30-40	BWS	1RP,1P		-	3.6	34	22	08
148-2	E480 N599	30-40	BWS	1A		-	2.5	23	19	10
148-3	E480 N599	30-40	BWS	1RP		-	3.6	30	22	06
150	E480 N599	40-50	BWS	1S		-	4.2	32	15	07
160	E480 N600	20-30	BWS	2S,1RP		-	4.0	39	30	05
161-1	E480 N600	20-30	BWS	1S		-	1.5	27	21	03
161-2	E480 N600	20-30	BWS	1A		-	5.4	34	26	07
161-3	E480 N600	20-30	BWS	1S		-	5.4	36	27	05
163***	E480 N600	21	BWS	2S		-	107.2	82	59	23
162	E480 N600	22	BWS	1S		-	18.4	70	33	09
165	E480 N600	26	BWS	1R,1RP		-	4.5	35	29	08
153	E481 N599	20-30	BWS	1S		-	7.7	48	28	08
156	E481 N599	30-40	BWS	1A		-	1.3	30	17	04
209	E481 N600	20-30	BWS	1S		-	6.0	38	31	06
221	E481 N601	30-40	BWS	1P		-	1.9	27	13	09
BLOCK B										
42	E476 N625	44	BWS	2S		-	1.3	20	17	06
40	E476 N626	25	BWS	1S		-	21.5	51	40	12
45	E476 N626	55	BWS	1R		-	5.5	34	20	08
84	E477 N626	34-44	TWS		1S	-	6.5	44	37	04
89-1	E478 N625	44-54	TWS	1S		-	3.5	35	25	04

(Continued)

Table 55. Descriptive data for the edge-modified flakes recovered from 23JA38 (continued).
Page 2

CATALOG NUMBER	PROVENIENCE	DEPTH Below Surface	MATERIAL TYPE*	EDGE SHAPE AND WEAR** Convex-Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (mm) Length	Width	Thickness
89-2	E478 N625	44-54	BWS	1RP		-	2.8	36	21	04
85	E478 N625	44	NL	1S		+	11.3	40	24	12
104	E478 N626	44-54	BWS	1S,1RP		-	2.5	42	21	03
131	E479 N625	34-44	BWS	1S		-	1.5	26	13	04
136-2	E479. N625	44-54	BWS	1S		-	3.8	32	25	06
BLOCK C										
268	E484 N612	20-30	BWS	1A		-	1.0	27	18	03
FEATURE 2										
280	E509 N625	10-20	BWS	1S		-	2.7	31	27	05
283	E509 N625	37	BWS		1S	-	8.4	43	22	20
TEST UNITS										
198	E480 N621	42	NL	1S		+	5.0	32	27	06
285	E499 N648	30-40	NL	1S		-	2.5	24	23	05
58	E477 N603	0-10	BWS	1A		-	1.9	21	18	05

*Material type: (BWS) Blue Winterset, (TWS) Tan Winterset, (NL) Non-Local Chert
**Edge wear: (A) Attrition, (P) Projection, (R) Retouched, (S) Step flake
*** Reworked Tabloid

some curved surface such as a bone or wooden shaft. The tools associated with Feature 1 have a mean working edge length (8.93 mm), slightly smaller than those of Feature 4 (13.22 mm), but the functional significance of this is unclear. In other features the flake tool assemblages of these two areas are relatively similar. Figure 115 e-k illustrates some examples of these tools.

Marginally Retouched Tabloid (n=1)
The tool is a tabular fragment of Winterset chert (Fig. 116a). It has a brown patina on both surfaces and appears to have been weathered for some time. It has four edges with moderately heavy attrition and step fracturing. It appears to have been utilized as a heavy duty scraping implement. Some of the patina covers the flake's surface, so the weathering apparently took place subsequent to utilization. This artifact was recovered from Feature 1.

Lithic Manufacturing Debris

Manufacturing debris consist of unretouched and unused flakes (debitage), cores, chunks, and shatter. These artifacts are not associated directly with tool usage: rather, they are unused by-products of the inhabitants of chipped-stone industry. Most (94 percent) of the materials are local Winterset chert.

Cores (n=4)
Four cores were recovered from the site (Fig. 116b-e). Two of these came from the area of Feature 1 while the others were recovered from test units. All are irregular cores of Winterset chert.

Chunks (n=6)
Chunks are irregularly shaped, angular pieces of Winterset chert. They are the result of breakage along multiple intersecting calcitic and ferrous joint planes characteristic of Winterset chert (Reid 1978).

Debitage (n=544)
Debitage consists of unused flakes mostly local Winterset. Although non-Winterset chert on the site made up only a very small percentage of the total debitage, its distribution across the site is interesting. These flakes are generally white or pink chert, considered here as "exotic". All of these materials are small, under 2 cm in length, and nearly all are tertiary reduction flakes. The percentages of these flakes in the three excavation blocks show an increase towards the north. These flakes make up only 1 percent of the flakes in Block A, 3 percent in Block C and 13 percent in Block B. A similar relationship is seen in the test units with only units E480, N620-621, and E498, N625 having any non-Winterset chert.

Flotation of matrix from the blocks recovered a large number of tiny (1-2 mm) tool sharpening and retouch flakes. Their distribution density is similar to that of the larger flakes.

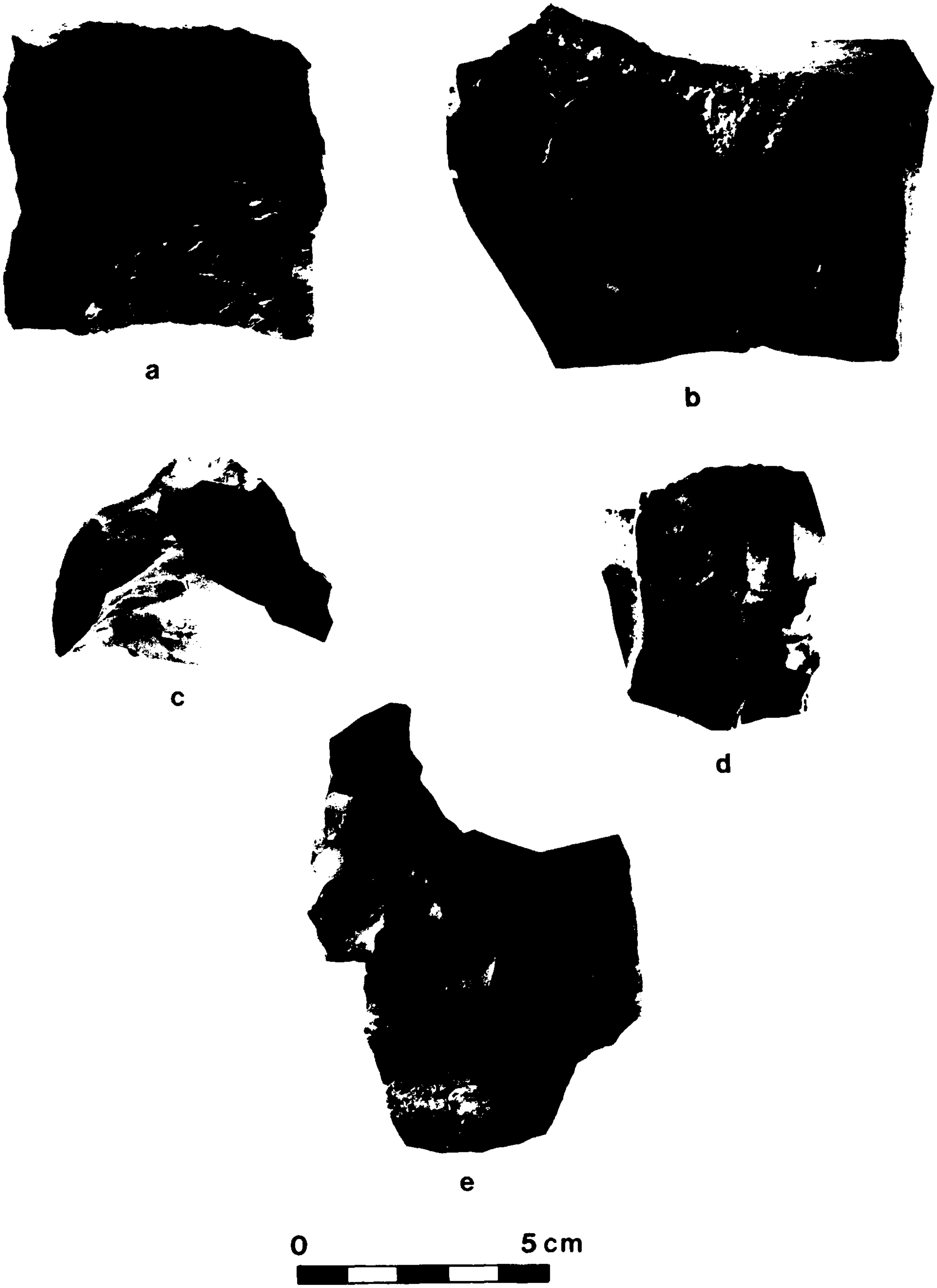

Figure 116. Chipped stone artifacts from 23JA38: (a) marginally retouched tabloid, (b-d) cores, (e) core from Feature 1.

Miscellaneous Lithic Artifacts

There was a small sample of lithic artifacts which did not fall into the category of chipped stone. These consisted of hearthstones and unworked stone.

Hearthstones (n=29)

All of the hearthstone recovered from the site came from the area in and around Feature 2. This feature consisted of a small concentration of burned limestone (Fig. 113). Hearthstones ranged in size from small fragments, 2-3 cm in size, to medium sized cobbles, 15-20 cm in diameter.

Unworked Stone (n=79)

Unworked stone consisted of fragments and cobbles of limestone. They ranged in size from tiny pebbles to medium sized cobbles and showed no evidence of heating or modification. Approximately 60 percent of this material was recovered from the 0-30 cm levels, or generally within the plow zone.

Hematite (n=2)

Two samples of hematite were recovered. One is a small lens of ochre, or crushed hematite, from 58 cm below surface in 621N, 480E. It formed a small reddish brown soil stain about 5 cm in diameter. It could be the results of ochre processing or the weathering of hematite. The other is unmodified chunk of hematite 3 cm in length, located 34 cm below the surface in unit 626N, 477E near the firepit in Block B.

FAUNAL ASSEMBLAGE

The 1979 excavations recovered a sample of unworked bone from Bowlin Bridge. A total of 203 bones or bone fragments were recovered, mainly from the areas of Feature 4 and 5. Both burnt and unburnt bone was recovered, but all of the burnt material was small, unidentifiable fragments. The bone was generally in poor condition and only eight specimens were identifiable. Four mammal species were represented by these fragments.

Bison bison (MNI=2)

The largest sample of identifiable material was that of *Bison bison* and consisted of left mandible of a young adult with premolars and molars intact from Feature 4; the distal epiphysis of the tibia; the proximal end of a radius and a left mandible and molars from the area of Feature 5. A minimum number of individuals of two was based on the presence of two lower left mandibles from the site. The bone was generally in fair condition. There is quite a bit of other bone which, from thickness or general characteristics, appears to be highly fragmented bison material. Bison are grassland adapted species and would have been available in both the upland and lowland prairie environments near the site.

Microtus spp. (MNI=1)

A single specimen of vole was identified from flotation samples from the area of Feature 2. The specimen is a left mandible. This species is found throughout Missouri in dense grass environments and is likely intrusive.

Spermophilus spp. (MNI=1)

One M-1 identified as ground squirrel was recovered from the flotation from Feature 2. This is also a grassland-adapted animal and is likely intrusive to the cultural deposit.

Tamias striatus (MNI=1)

The eastern chipmunk is also represented in the flotation from Feature 2 by a single M-3 with wear on its occlusal surfaces. This is a woodland adapted species and is also likely intrusive to the site.

Discussion

The only faunal remains from 23JA38 which have definite archaeological significance are bison. At least two individuals are represented in the sample and these were recovered in two se arate features.

The presence of bison remains in both Feature 4 and Feature 5 can be interpreted as further evidence that they are related and to separate them both from Feature 1, in which no bone was recovered.

Due to the large size of a bison, it is likely that it would be completely butchered at the kill site and only small amounts of bone would return to the campsite or processing area if any distance was involved. This appears to have been the case at Bowlin Bridge as the recovered bone consists of only the articular ends of the lower leg bones and the lower jaws. These parts might come in with the stripped muscle tissue and the tongue.

The small mammal remains are likely intrusive and are animals which could easily be expected to be found in the vicinity of the site today. The presence of the three species in the same location within the site could indicate the presence of a carnivore den at some time in the past.

PLANT REMAINS

The floral assemblage from 23JA38 was recovered from this general excavation and from the waterscreening and flotation soil matrix from the areas of relatively high artifact density. The majority of the seeds and nut fragments were recovered from the flotation samples. The carbonized floral material was all recovered from the areas of Feature 2, 4 and 5 which are interpreted as being related to the Mississippian period May Brook phase component at the site. No definitely carbonized seed or nut remains were recovered from flotation samples from the area of Feature 1, which is interpreted as relating to an Early or Middle Woodland occupation.

In addition to carbonized floral remains there was a large sample of uncarbonized seeds and a number of charcoal fragments. The number of uncarbonized seeds in any given sample is generally greater than that of the carbonized material and the light fraction in nearly all samples also contained fine root material and other plant remains. While these uncarbonized seeds may have been associated with the cultural use of the site, they could

also have been deposited there by non-cultural processes such as root, rodent or insect action, or as natural seed rain mixed with the matrix samples during excavation or processing. Although it is possible that the charred seeds were similarly introduced, their carbonized form and association with burnt bone and other cultural debris and features is highly suggestive of an association with cultural occupation. Due to the lack of such evidence for uncarbonized remains, we will treat them as intrusive to the site. Since the cultural association of charred floral remains is not certain, we will also exercise caution in their interpretation.

Many of the carbonized seeds were fragmentary and could not be identified. A total of 118 specimens were identified and these represent 14 taxa (Table 56). The remains were analyzed by Ralph Brooks, Assistant Director of the University of Kansas Herbarium. Identifications were made to the most specific level possible.

The following discussion briefly summarizes the plant remains recovered from the Bowlin Bridge site and information on habitats, methods of seed dispersal and some ethnographic documentation for usage of some of the species represented. I have relied on Steyermark's Flora of Missouri (1963) for information on the habitats and description. Much of the information on seed dispersal and season of availability is based on Schmits (1980).

Carbonized Seeds

A total of 189 seeds from the flotation sample were identified as carbonized. Of these, 105 were identifiable to genus or species.

Amaranthus sp. (pigweed) (n=21)
Amaranths are annual herbaceous plants frequently found in disturbed areas. *A. rudis* (waterhemp) is a tall plant, up to 2 m in height which is found in moist alluvial soils, mud flats, stream banks and along oxbow lakes. The female plants will produce several thousand seeds. *A. albus* and *A. graecizans* (tumbleweeds) are short broad, bush-like plants up to 1 m tall. They occur in waste areas, cultivated ground and sandy or gravelly areas along streams and produce several thousand seeds. *A. retroflexus* (rough pigweed) is fairly common and widespread throughout Missouri and occurs in cultivated and waste areas and occasionally in dry open places on bluff tops and in prairies. Amaranths drop their seeds to the ground but since they are small and light they are easily blown about and washed by rains. The seeds of these plants are available in late August through October. Amaranths are known to be extremely prolific seed producers.

Ammannia sp. (ammannia) (n=43)
Ammannia is a small annual plant, 20-25 cm in height, which produces small capsules of seeds. *A. auriculata* (ammannia) and *A. coccinea* (tooth cup) occur in Missouri (Steyermark 1963: 1089). The latter is common and widespread and is found on muddy stream margins, ponds and sloughs. Each plant produces hundreds of seeds which are available in late August through October. The seeds are light and could be blown on the ground or washed about by rains or flooding.

Table 56. Carbonized seed remains from 23JA38.

	FEATURE 2	FEATURE 4			FEATURE 5			
	30-40 BS	34-44	44-54	54-64	30-40	40-50	50-60	Total
CARBONIZED SEEDS								
Amaranthus sp. pigweed			3			7	11	21
Ammannia ammania			36	7				43
Chenopodium sp. goosefoot				1				1
Cheonopodium hybridum mapleleaf goosefoot			1	1		1		3
Datura Stramonium jimson weed			1					1
Euphorbia glyptosperma spurge				1				1
Portulaca mundula Johnson purslane	2					3	3	8
Sisyrinchium sp. blue-eyed grass							4	4
Thlapsi arvense penny cress			1			8		9
Viola sp. violet		2		8		3		13
Zea mays corn					1			1
Total Identified	2	2	42	18	1	22	18	105
Total Unidentified	7		21	28		28		84
TOTAL	9	2	63	46	1	50	18	189

There is no ethnographic evidence for prehistoric usage of these plants. Ammannia was the most numerous single seed group identified from the sample, however, and all of the specimens of this plant were recovered from the flotation from the area of Feature 4.

Chenopodium sp. (Goosefoot) (n=1)

The chenopods are annual plants, 60-100 cm in height, which have flowers and fruits in thick spikes. The seeds are available from September through October and as many as 175,000 seeds have been counted on a single plant of red goosefoot, C. rubrum (Martin, Zim and Nelson 1951:389). The three most common native species in Missouri are C. standleyanum (goosefoot), which occurs in dry or moist soil, shaded woodland, thickets, rocky or rich ground and on ledges or bluffs; C. album, which occurs in waste and cultivated ground; and C. hybridum, which occurs in rich, open soils, woodlands, along shaded ledges, slopes and bluffs.

Chenopodium hybridum (mapleleaf goosefoot) (n=3)

Three specimens of this species were identified from the areas of Feature 4 and 5. Both the plant and the seeds of this plant are larger than those of the other chenopods but fewer seeds are produced by each plant. The seeds of all these plants are easily moved around by wind and water.

Datura stramonium (jimson weed) (n=1)

Jimson weed is a coarse, heavy scented annual and occurs in dry or waste ground, cultivated fields and rocky open places. Steyermark (1963:1324) reports that children have been poisoned by eating the unripe seeds and that the plant is sometimes poisonous to cattle. The seeds are numerous. The plant has been used for its medicinal and narcotic properties since early times (Steyermark 1963:1325).

Euphorbia glyptosperma (spurge) (n=1)

Spurge is an annual herbaceous plant occurring on sand base and moist alluvine ground and is found in northwestern and northeastern Missouri. It produces moderately large (1 mm) and distinctive (Steyermark 1963:986) seeds, but does not produce them in large number.

There is no ethnographic evidence for use of the plant in this area and the single specimen may have been accidentally charred and not represent prehistoric utilization. The sap of the plant is quite acid and has an irritating effect on many persons. It is poisonous to cattle (Steyermark 1963: 984).

Portulaca mundula (Johnson purslane) (n=8)

Purslane is a short upright mat-forming plant 5-13 cm in height. The seeds are borne in capsules and are available from August to October. Each plant can produce several hundred or more seeds which are scattered by wind and water. Portulaca mundula occurs on sandstone, chert and limestone glades and the edges of rocky exposed bluffs and escarpments (Steyermark 1963:634).

Sisyrinchium sp. (blue eyed grass) (n=4)

Blue eyed grass is found in open woods, meadows, prairies and green grassy vales. It is a perennial grass-like herb with black globular seeds (Gleason and Cronquist 1963:219). The species are widely distributed S.

campestre and S. bermudiana are the most common in Missouri (Steyermark 1963: 466-467).

There is no direct ethnographic information concerning Sisyrinchium in this area but the seeds of most grasses can be collected and eaten.

Thlapsi arvense (penny cress) (n=9)
This plant is an introduced European native which can be found along roadsides, in fields, meadows and waste ground (Steyermark 1963:742). It is a member of the mustard family and produces seeds which can be used as a substitute for mustard.

The fact that Thlapsi is an introduced species tends to indicate that these are intrusive specimens which have been carbonized by field fires or that they are misidentified as carbonized. In any case, they are not significant in terms of prehistoric subsistence.

Viola sp. (violet) (n=13)
These are broad leafed flowering plants. Various species can occur in a wide variety of habitats. The common form in Missouri, V. pedata, is found in rocky or dry open woods on upland slopes and ridges, prairies and rocky, open glades. V. cucullata, however, is found in swampy, spring-fed, calcerous meadows. V. papilionacea occurs along roadsides and railroads, low alluvial ground burdening streams, ponds, wet ditches, meadows, fields, wet ledges of bluffs, thickets and green ground (Steyermark 1972:68).

There is no ethnographic evidence for utilization of Viola in this area. The dog tooth violet (Erythrenium sp.) were eaten raw by the Winnebago (Gilmore 1919:71).

Zea mays (corn) (n=1)
One fragmentary kernel which has been tentatively identified as corn was recovered from the 30-40 cm level of Feature 5. It was not possible to identify the variety of corn. Zea mays is a cultivated crop first domesticated in the region of central Mexico and introduced to many other areas in North America. Zea mays is reported by Gilmore (1919:71) to have been cultivated by all the tribes of Nebraska and has been recovered from a number of archaeological sites in Missouri and Kansas from the Mississippian time period (Chapman:1980). No definitely cultivated plants have previously been identified from May Brook phase sites and the question of horticulture in relation to this phase is still open though it appears that the primary adaptation was a hunting and foraging strategy.

Unidentified (n=84)
Eighty-four seeds were identified as carbonized but were too fragmentary to identify or had no surface markings or other characteristics to make identification possible.

Carbonized Nutshell

Twenty-eight fragments of carbonized nutshell were recovered from the general excavation and flotation samples at the Bowlin Bridge site. Of these, 13 were identifiable (Table 57).

Table 57. Carbonized nut fragments from 23JA38.

	FEATURE 2	FEATURE 4			FEATURE 5			Total
	30-40 BS	34-44	44-54	54-64	30-40	40-50	50-60	
CARBONIZED NUTS								
Carya sp. hickory				1				1
Carya cordiformis bitternut hickory	2				2	6		10
Juglans nigra black walnut	1		1					2
Total Identified	3		1	1	2	6		13
Total Unidentified	3	3	2		3	4		15
TOTAL	6	3	3	1	5	10		28

Carya sp. (hickory) (n=1)

The largest percentage of nut remains from the site were hickory with the majority identified as *C. cordiformis*.

Three species of hickory are present in Jackson County (Steyermark 1963: 516-521). *C. cordiformis*, (bitternut hickory) occurs in rich and alluvial soils, *C. ovata* (shagbark hickory) is found in lowland and upland woods and *C. teyana* occurs in dry rocky upland woods. The nut of the hickory is available from September through October.

Carya cordiformis (bitternut hickory) (n=10)

The majority of the hickory nuts from the Bowlin Bridge site were identified as *C. cordiformis*. As noted previously these nuts are available in October and the species is found on rich alluvial soils.

Juglans nigra (black walnut) (n=2)

Two fragmentary walnut shells were recorded from Feature 2 and Feature 4. According to Steyermark (1963:510), this species is found in rich woods at the base of slopes or bluffs, in valleys along streams, and in open and upland woods. The nuts are available in October.

DISCUSSION

The majority of the carbonized seeds recovered from the Bowlin Bridge site are those found in a lowland environment which is occasionally flooded. Ammannia is an aquatic plant, amaranths, chenopods, spurge and violet could be found in alluvial soils or disturbed areas along streams. The purslane and Jimson weed and some of the violets can be found in rocky areas on bluff tops or slopes similar to those near the site.

In general, the amaranths and ammannia had relatively high frequencies of occurrence (21-43 specimens) and could be considered as probably subsistence items. These species were also the highest frequency plant remains at the May Brook site (23JA43) Unit III occupation. Also high in frequency at May Brook were purslane and goosefoot, both of which were recovered at Bowlin Bridge.

Most of the species are available in the summer or fall and the majority are available during August through October, suggesting a fall occupation.

The presence of a number of carbonized nut fragments also suggests a fall occupation. These species are available in October and so suggest a period of occupation in the late fall. They also suggest that the locally available mast resources played a role in the subsistence strategy of the aboriginal inhabitants of the site.

SUMMARY AND INTERPRETATIONS

The Bowlin Bridge site may contain two chronologically distinct occupations. An early occupation is indicated by a C-14 determination of 2440±90

B.P. (490 B.P.), associated with Feature 1 at the southern end of the terrace. This feature is spatially separated from the others on the site and appears to be primarily a lithic tool production area. Faunal remains from this area were extremely limited, consisting of only two unworked bone fragments from the plow zone. The radiocarbon date places this portion of the site in the Early Woodland.

Early Woodland habitations are poorly known in the Kansas City area. The best evidence for such occupations comes from the Traff site (23JA159), located about 4 km upstream from 23JA38. Radiocarbon dates of 395±70 B.C. (UGA-2535) and 505±80 B.C. (UGA-2404) are associated with the remnants of a full range of domestic activities. According to the number and variety of artifacts, the Traff site probably was an occupation of some duration and intensity (Wright 1980). Two other, smaller sites 23JA40 and 23JA36 contain Early Woodland occupations. At 23JA40, this period is indicated by a C-14 date of 350±100B.C. (UGA-1973). This site consisted of a series of small hearths and small debitage features on the flood plain of the Little Blue River. Only a fragment of a corner-notched point is associated with the Early Woodland date. A C-14 date, 450±85 B.C. (UGA-1973), also indicates an Early Woodland occupation although no tools or ceramics were associated with the dated sample (Brown and Ziegler 1977). Thus, the Bowlin Bridge site is similar to 23JA36 and 23JA40 as far as the Early Woodland occupations are concerned: they are small habitations which do not indicate intensity of occupation and lack direct association of absolute dates and culturally diagnostic artifacts. Nonetheless, these sites and the larger occupation at the Traff site add an important dimension to habitation characteristics of the recently emerged Early Woodland period in the Little Blue River drainage (Wright 1979).

The second occupation of the site is dated on the basis of the ceramic materials at the site. They were originally attributed to the Kansas City Hopewell (Brown 1977:46) but are much closer in most attributes to the ceramics from the sites of the recently elucidated May Brook phase (Brown 1979, Schmits 1980). The majority of the Middle Woodland, Kansas City Hopewell, ceramics reported from the local area are plain surfaced and tempered with fine grit or sand. They are also generally relatively thin with body sherd thicknesses of around 6 mm (Martin, 1976, Shippee 1967, Katz 1974, Reeder 1978). Ceramics from the Bowlin Bridge site are cordmarked and sherd tempered with body thicknesses averaging 8.6 mm. These are similar to the pottery recovered from the May Brook phase components at the Black Belly site, 23JA238, and at the May Brook site, 23JA43. The Bowlin Bridge body sherds are somewhat thicker than those of the other two sites but when the three pottery samples are examined together the similarities are confirmed. The ceramics from the May Brook site and those from the Seven Acres are similar to those from Pomona focus sites of eastern Kansas (Schmits 1980). The small size of the sample from 23JA38 and the possibility that it represents only one vessel makes intensive statistical comparison of this material to others unfeasible. The small ceramic assemblage and its spatial limitation on the site is one more indication that the site was likely not occupied for extended periods of time.

The cultural affiliations of Feature 2 and 4 cannot be directly ascertained as there were no diagnostic artifacts or datable carbon associated with

either. Both of these features are located north of Feature 5, where the ceramics were recovered, and these three areas all exhibit markedly different artifact inventories than that of Feature 1.

The artifact assemblage of Feature 1 was characterized by a large number of chipped stone tools and debitage but no faunal or floral remains or ceramics. The chipped stone tools included six (46 percent) of the 13 bifacial artifacts from the site and 53 percent of the edge modified tools.

Feature 2 contained only a small lithic sample, much of which was tiny tool sharpening or utilization flakes, but there was definite evidence of a hearth associated with the feature.

Feature 4 was characterized by a heavy lithic concentration with faunal remains and charred nut and seed remains. Chipped stone tools consisted primarily of edge modified flakes but 3 bifacial tool fragments were also recovered. The feature is definitely associated with a hearth like feature from which floral remains were recovered.

Feature 5 contains only a small lithic sample with only a single lithic tool represented. It does, however, contain 96 percent of the bone from the site and a number of fragments of charred nut and seed. It also contained all the ceramics from the site. The close proximity of the features indicates that Features 2, 4 and 5 are probably related and belong to the Later May Brook phase occupation and that Feature 1 is related to an earlier Woodland occupation of the site.

Lithic Industry

Lithic manufacture and/or tool maintenance is evidenced in varying intensities over most of the site. Though most of this activity appeared to take the form of tertiary stage lithic reduction, some on-site secondary stage reduction is evidenced by the presence of four cores of Winterset chert.

The greatest percentage of tools from the site are marginally retouched flakes. Such tools require little or no preparation and would not likely be curated when the immediate task for which they were chosen was completed. This is a pattern common to the majority of sites in the Little Blue Valley and is probably related to the availability of workable chert in the area. The lithic procurement option utilized over most of the prehistoric period in this area is one which has been referred to elsewhere as a casual procurement strategy. In such a strategy no major expenditure of effort is required to travel to specific quarries and mine the raw material, but rather the material is distributed widely in easily obtainable form and can be procured during the course of other activities. This is the case with the cherts of the Little Blue Valley. Numerous outcroppings are available and it is also abundant in colluvial deposits over the whole area. Associated with this form of procurement is a heavy dependence on unmodified flakes for most tool applications, since there is no need to curate or maintain tools to conserve raw material.

The edge morphology of most flake tools indicates that they were not being utilized for flat surface work, such as hide-working. Most have working edges which are too small or improperly situated for such work. They appear to have been utilized in working some type of wood or bone shaft. Both cutting and scraping tools are represented.

Although few examples of the more formalized tool categories such as bifacial or unifacial scrapers or knives were recovered from the excavations, their presence on the site can be inferred from the recovery of sizable numbers of small tool maintenance and utilization flakes of both local and non-local materials from the deposits. The lack of such tools in the site inventories seems to indicate that they were being curated and removed from the site. Those formalized tools which were recovered from the site were all bifaces and all but two of these were broken.

Settlement and Subsistence Characteristics

Most of the information regarding subsistence strategies and dietary influences come from the May Brook component. The plants and animals represented indicates exploitation of locally available food stuffs, but, due to small samples, it isn't possible to infer dietary reliances. The strategy of hunting and gathering local resources is one that was well established during the Late Archaic (ca. 1605 BC) at Nebo Hill (Reid 1978) and continued well into Woodland and Mississippian times in the Kansas City area.

There is no indication that either the Early Woodland or May Brook components represents occupations of any intensity. This determination is based on comparisons with other occupations. Large and/or permanent sites are often characterized by the presence of dense middens and trash filled storage pits, such as those at the Trowbridge site 14WY1 (Bell 1976), the Young site, 23PL4 (Adair 1977) and Renner, 23PL1 (Wedel 1943). In addition, Johnson distinguishes permanent Hopewell villages from ancillary special-purpose camps by examining the frequencies of artifact categories: a site with 20 categories compared to a site with 43 categories indicates that a small range of activities occurred at the former (1976:9). Similarly, Campbell (1968), Yellen (1977) and Reid (1978) examined artifact categories and frequencies to determine duration and intensity of occupation. The limited number of complete and broken chipped-stone tools, absence of ground-stone, trash-filled storage pits and dense cultural middens at 23JA38 indicates that is was a transient settlement, perhaps for brief excursions related to food procurement.

CHAPTER XI

MOUSE CREEK SITE (23JA104)

David H. Jurney, Jr.

INTRODUCTION

Site 23JA104 is located on Mouse Creek about 2.5 km southeast from its confluence with the Little Blue River. The site is situated on a low terrace directly to the east of a meander in the creek (Fig. 117). The Mouse Creek vicinity is characterized by sloping uplands to the west and east and a low alluvial flood plain to the west and south.

The site was reported in 1973 by Henry Lang, a local collector, and officially recorded by a University of Kansas, Museum of Anthropology (KUMA) survey crew (Heffner 1974:23). The site area reported by Heffner (1974) included the flood plain within the Mouse Creek meander loop at an elevation of 272.5 m (894 ft) and a portion of the low terrace approximately 50 cm above the flood plain (Fig. 117). Flood channel cuts are present on both of these topographic features. Lang's artifact collection includes grit-tempered pottery sherds, contracting and expanding stemmed projectile points and Sedalia-like lanceolate points gathered from several locations (Lang, personal communication). It is not certain which artifacts are from the area of the site. The University of Kansas 1973 survey crew was not able to obtain permission to collect from the site; but the KUMA 1976 survey team recovered a grab sample of 41 artifacts from the surface, including two large projectile points, one with side notches and one with corner notches. On the basis of this collection, the site was tentatively assigned to a Late Archaic cultural affiliation (Brown 1977:99).

The 1979 mitigation program at Mouse Creek, 23JA104, had the following research objectives: (1) determination of the depth and extent of the cultural deposit, (2) delineation of stylistic and functional tool types, lithic reduction sequences, and thermal alteration of raw material in the artifact assemblage, (3) determination of the nature and, if possible, the season of occupation at the site, and (4) location of sources of lithic raw materials. These research objectives were implemented by the hand excavation of test units and two block excavations. Diagnostic artifacts and tools were mapped to the nearest centimeter. Flotation samples were taken to recover microscale floral and faunal remains. Several units were subsampled and dry-screened through ¼ in (6.4 mm) mesh screen. Local sources of chert were investigated and samples taken.

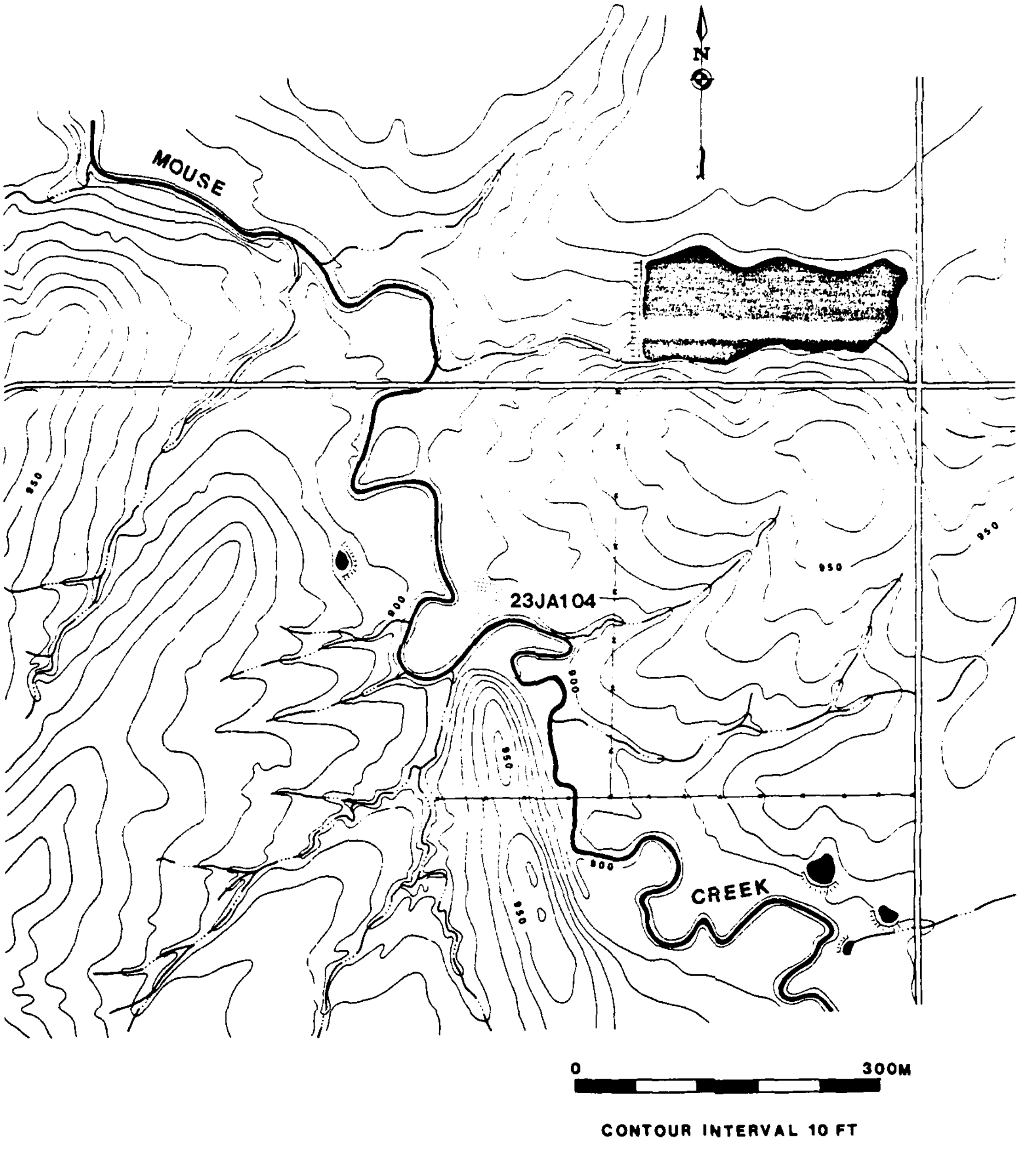

Figure 117. *Location of 23JA104.*

ENVIRONMENTAL SETTING

The Mouse Creek site is located on the upper drainage of the Little Blue River, approximately 60 km south of the confluence of the Little Blue and Missouri Rivers. The bedrock geology of the site is composed of the Wea shale and Winterset limestone. Both of these geologic strata have been heavily eroded. Tan and blue Winterset cherts are available in the hillside regolith created by the weathering of the Winterset limestone. The local topography is characterized by the narrow flood plain of Mouse Creek, the gently sloping hillsides and extensive rolling uplands. Minor periods of brief flooding could be expected at the site in the spring and early summer. The location of the site near the upper valley gradient decreases the probabilities of frost and severe temperature extremes during the cool seasons of the year. The Soil Conservation Service has mapped the soil at Mouse Creek as a Kennebec silt loam which is moderately well drained and has formed in flood plain alluvium.

Based on the United States General Land Office Surveys conducted in 1826, Mouse Creek was located in a narrow zone of slope-upland forest surrounded by upland prairie. Flood plain tree species were limited to the stream banks. As the site is located near the slope-upland and upland prairie fringe, minor fluctuations of this zone and plant species composition can be expected due to climatic perturbations (Bryson and Wendland 1967). The 1826 slope-upland forest in this area was composed of dominant black and white oaks with some hickory, linn and black walnut. Upland prairie grasses and forbs were present in the understory vegetation. Common animals in this zone included white-tailed deer, turkey, squirrel, cotton-tail, raccoon, opossum, bear, bison and wapiti.

The edge environment in the vicinity of Mouse Creek provided a range of food resources. Nuts and acorns become available in the fall. Grasses and forbs also provided large quantities of seeds in the summer and fall. In the fall certain species of animals such as deer, turkey, bison and squirrels undergo gains in body weight, congregate in herds and flocks and were known historically to migrate at this season between upland prairie and the slope-upland forest (McKinley 1960, Schorger 1966). The location of the site near the drainage of the Little Blue allowed ready access to upland prairie and slope-upland forest resources. The proximity of Mouse Creek provided a dependable source of water in all but the most severe periods of drought.

DESCRIPTION OF INVESTIGATIONS

Heavy weed cover obscured visibility during the initial reconnaissance of 23JA104. The vegetative cover was removed by mowing and plowing the reported area of the site inside the meander and a portion of the low terrace northeast of the meander. Artifacts were noted only on the low terrace.

All excavation units were laid out in reference to true north. As the flood plain had been included in the site area (Heffner 1974; Brown 1977), four one by two m test units were placed on the flood plain (Fig. 118). Test

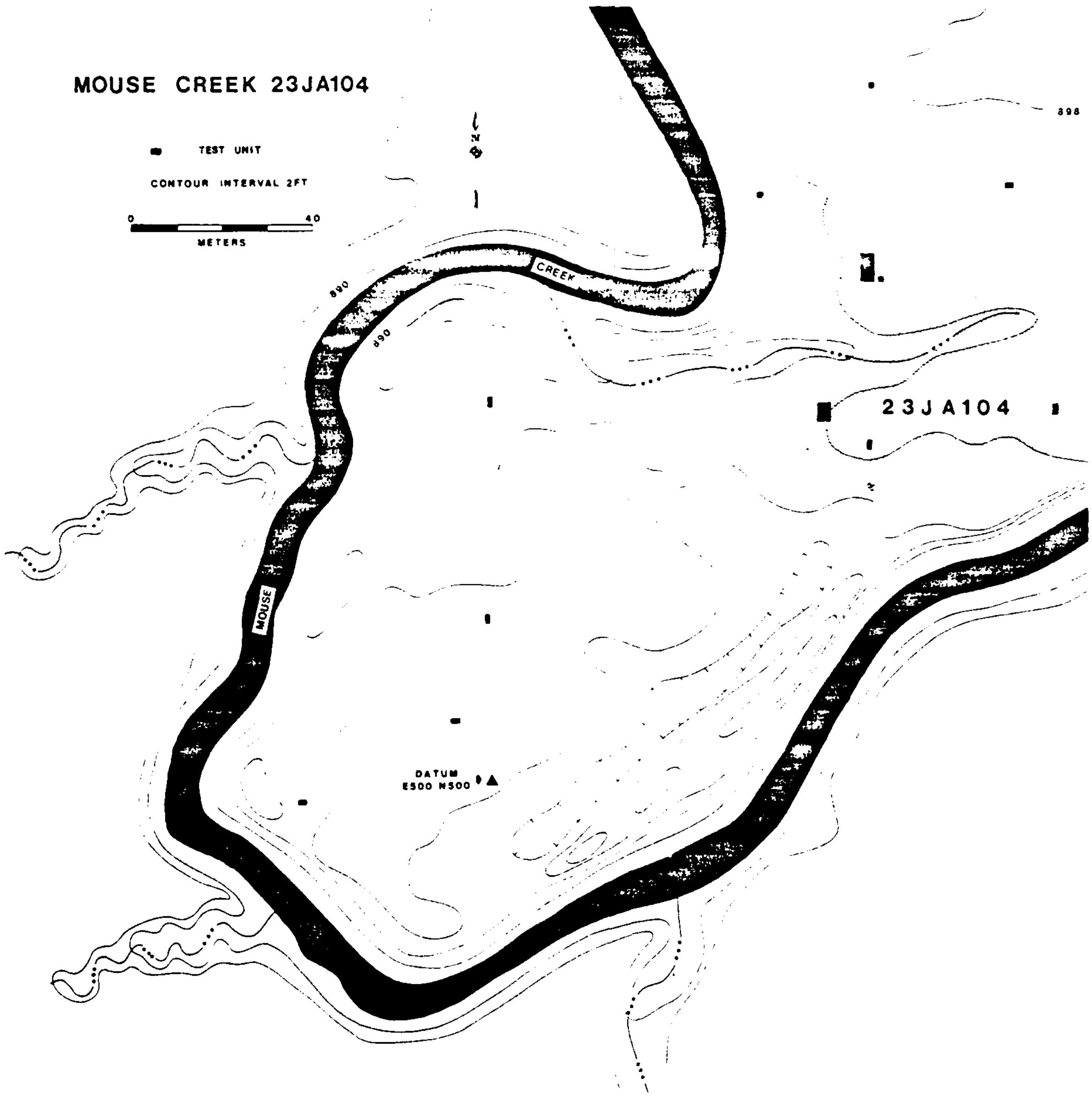

Figure 118. Plan view of excavations at \104.

Figure 119. General view of excavations at 23JA104. (Upper) Block A in progress. (Lower) Block B in progress.

unit depths ranged from 50 to 90 cm below the surface, but no prehistoric cultural materials were recovered.

Five one by two m and two one by one m test units were then excavated on the low terrace. The subsurface site limits corresponded with the surface distribution of artifacts shown in Figure 118. Two block excavations, 19 sq m and 12 sq m, were laid out over the most productive one by two m units (Fig. 119). The 0-20 cm level, corresponding to the plow zone, was removed as one level. Each one m unit within the block excavations was then excavated in 10 cm levels below ground surface. Proveniences of tools, cores, and pottery sherds were recorded to the nearest cm. Six one by one m units in Block A were dry screened through a 6.4 mm (¼ in) mesh screen. Soil samples were saved from three one by one m units in Block A and from all units in Block B for flotation and waterscreening in the laboratory. Soil samples for flotation and waterscreening ranged from 1.5 liters to 25 liters. A total of 91 liters of soil matrix was processed. Based on the subsurface investigations at Mouse Creek, it is estimated that the site covered an area of 3800 sq m, somewhat smaller than the previously reported area.

Stratigraphy

The flood plain of Mouse Creek is a recent alluvial deposit consisting of laminated silts. The three strata were found in the test unit excavated in the flood plain meander loop west of the site. These strata have gradational contacts. The uppermost stratum is a dark brown silt with weak granular structure and gray silt laminae present. This stratum extends 35-40 cm below the surface with no evidence of a plow zone. The middle stratum is a very dark grayish-brown silt with gray silt lamina and a weak granular texture. The matrix is similar to the upper unit, but light silt bands are more abundant. The lowest stratum is a very dark grayish-brown clayey silt with a weak subangular blocky structure. Clay skins are present on ped surfaces. Clay skins are evidence of soil development. The upper two strata are probably recent, while the lower stratum was developed earlier. No prehistoric cultural material was recovered from any of these flood plain, meander loop strata.

The stratigraphy of the terrace fill in Block B revealed three alluvial strata which have a different soil structure than the flood plain deposits (Fig. 120). The upper stratum (0-28 cm) is a dark brown silt loam with fine subangular peds. The fine soil structure probably results from cultivation. Some lighter colored mottling and grains of ferruginous precipitates are present. The middle stratum is an irregular band of lighter brown silt loam with a fine subangular blocky structure. Reddish brown grains are common. Some darker mottling is present. The thickness of the stratum varies from 10 to 13 cm. The lowest stratum, which extends to the base of the excavation, is a dark yellowish brown silty clay with orange mottling. Clay skins occur on a structure of medium subangular blocky peds. Reddish brown and very dark brown grains are common.

The east wall profile of Block B consists of two strata. The upper stratum (plow zone) is a dark brown silt loam about 20 cm in depth. The lower

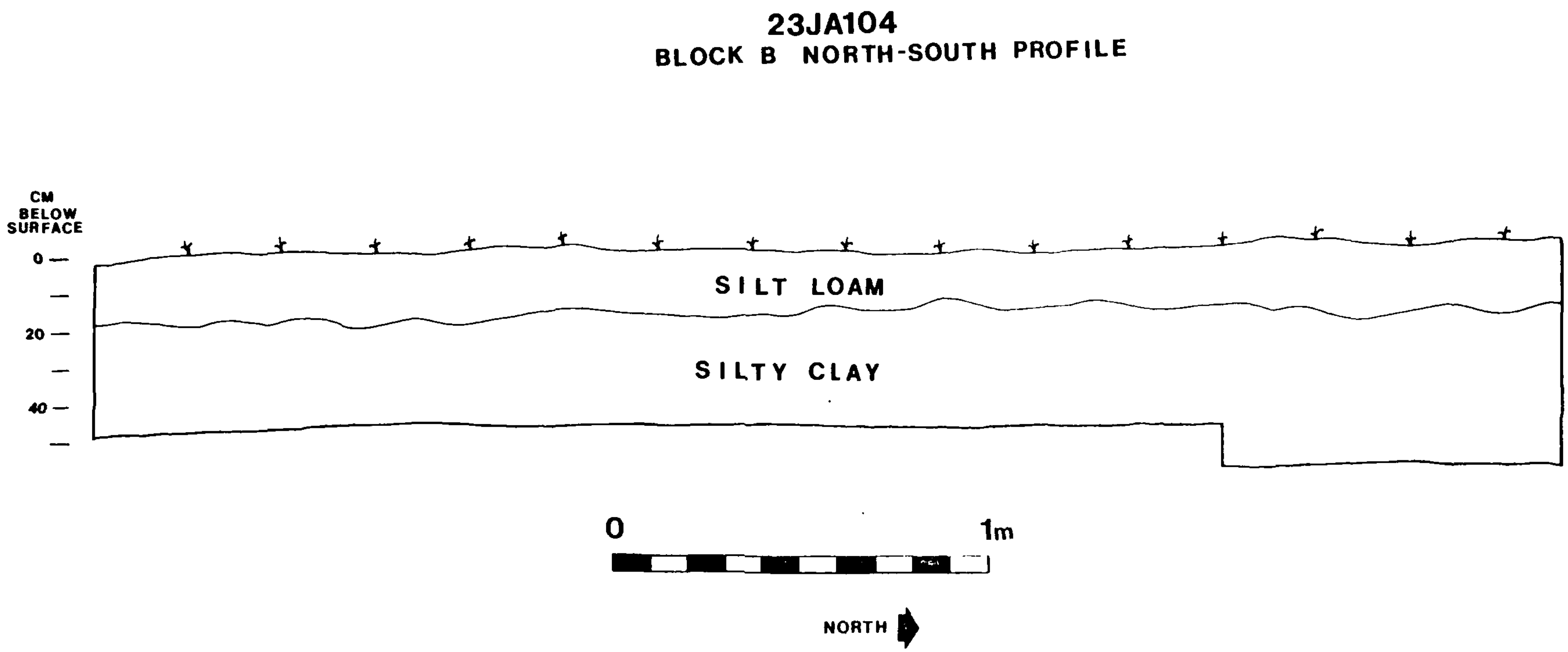

Figure 120. Profile of Block B at 23JA104.

stratum is a dark grayish-brown silty clay loam. The structure consists of small, subangular blocky peds with clay skins. Red and black grains occur throughout and a few silt lenses are present. The profile ends at 60 cm below the surface.

Prehistoric cultural occupation at Mouse Creek was limited to alluvial terrace deposits which were elevated above floodwaters in all but the most severe floods. The flood plain within the meander loop west of the site consists of over-bank deposits. The lowest stratum in the flood plain exhibits some soil development and may correlate in age to the terrace fill. The upper strata within the flood plain postdate the prehistoric occupation of the site.

ARTIFACT ASSEMBLAGE

A total of 1087 artifacts were recovered from 23JA104 (Table 58). The artifact assemblage consists of eight ceramic sherds, 45 chipped stone artifacts, 496 pieces of manufacturing debris, six ground stone tools and fragments, 14 minerals, 497 unworked stones, two charred nut hulls (possibly hazelnut), two pieces of bone, two uncarbonized nutshells (walnut and hickory) and 15 historic artifacts (coal, glass, ceramic, and metal).

Ceramics

Rim Sherds (n=1)

One rim sherd was recovered from the 40-50 cm level in Block A. This sherd was tempered with grit (crushed rock) and quartz with incidental inclusion of sherd or grog. The surface is extremely eroded, but was apparently smoothed. This sherd was from a globular to subconical jar with an everted rim, an orifice diameter of 15 cm and approximately a 20-30 liter capacity (Fig. 121a). The color is a uniform very dark gray indicating a reducing firing atmosphere. The sherd is 5.9 mm thick.

Body Sherds (n=7)

Seven small body sherds were recovered. Three were recovered in the 30-40 cm level of Block A. One was recovered from the 0-20 cm level and three from the 20-30 cm level in Block B. Three sherds are orange-red, indicating an oxidizing firing atmosphere, and four are dark brown, indicating a reducing firing atmosphere. All sherds are tempered with quartz sand, grit, and sherd or grog. Mean sherd thickness is 8.2 mm with a 1.6 mm standard deviation. The body sherds were thicker in order to support the vessel walls during manufacture and firing.

Chipped Stone Tools

Twenty chipped stone tools are made of blue Winterset chert, and 22 are made of tan Winterset chert. One tool fragment is a white chert. Both blue and tan Winterset are locally available, while the white chert is non-local (exotic) to the Kansas City Area.

Table 58. The artifact assemblage from Mouse Creek (23JA104).

	Excavation Level Block A					Excavation Level Block B					Excavation Level Test Unit					Surface	TOTAL
	0-20	20-30	30-40	40-50	50-60	0-20	20-30	30-40	40-50	50-60	0-20	20-30	30-40	40-50	50-60		
CERAMICS																	
Rim Sherds				1													1
Body Sherds			3			1	3										7
Total			3	1		1	3										8
CHIPPED STONE TOOLS																	
Projectile Points						1	1									1	3
Biface									1								1
Bifacial scrapers						1											1
Unifacial scraper	2	2	1	1		2	1		3								12
Biface fragment							4		1				1				6
Marginally Retouched Flakes		1	1	2		3	4	2	3		2					4	22
Total	2	3	2	3		7	10	2	8		2		1			5	45
MANUFACTURING DEBRIS																	
Cores	1											1				1	3
Flakes	14	26	36	14	7	54	54	86	76	25	28	4	6	1		31	462
Shatter	6	8	3	4		1	4	3	2								31
Total	21	34	39	18	7	55	58	89	78	25	28	5	6	1		32	496
GROUNDSTONE TOOLS																	
Manos				1													1
Nutting Stones							2										2
Fragments	2						1										3
Total	2			1			3										6

continued

Table 58 . (continued) The artifact assemblage from Mouse Creek (23JA104).

	Excavation Level Block A					Excavation Level Block B					Excavation Level Test Unit					Surface	TOTAL
	0-20	20-30	30-40	40-50	50-60	0-20	20-30	30-40	40-50	50-60	0-20	20-30	30-40	40-50	50-60		
MINERALS																	
Hematite	2	3	1			3	1	3			1						14
Total	2	3	1			3	1	3			1						14
Unworked Stones	28	58	63	40		63	47	54	43	8	16	15	6	6		50	497
ORGANIC REMAINS																	
Charred nut	1		1														2
Bone	1														1		2
Total	2		1												1		4
HISTORIC																	
Nut						1					1						2
Coal	5	4															9
Glass						1					1						2
Ceramic		1															1
Metal						1						1		1			3
Total	5	5				3					2	1		1			17
TOTAL	62	103	109	63	7	132	122	148	129	33	49	21	13	8	1	87	1087

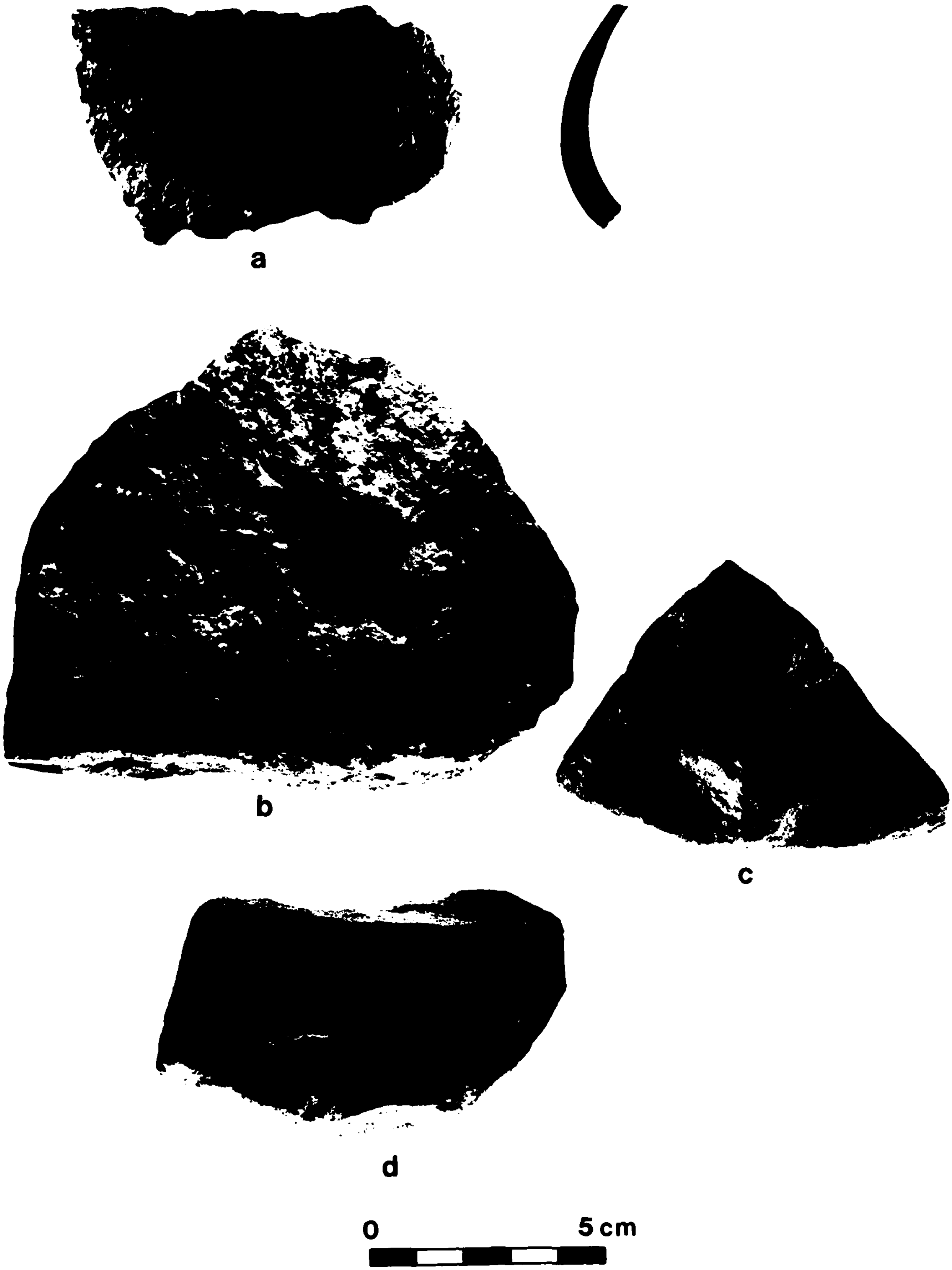

Figure 121. Ceramics and groundstone tools from 23JA104: (a) rim sherd, (b-c) nutting stones, (d) mano.

Bifacial Tools

Bifacial tools (Table 59) include three fragmentary projectile points, one knife or preform, one scraper, and six fragments; these comprised 30 percent of the chipped stone assemblage recovered at Mouse Creek. Four biface fragments ranging in thickness from 0.5 to 0.9 cm are thought to represent broken projectile points. Five bifacial tools were made of local blue Winterset chert, five from locally derived tan Winterset chert (two of which had been heat treated), and one small fragment of a projectile point from a non-local white chert. These tools probably functioned as piercing and cutting implements, and were curated until broken beyond repair.

Projectile Points (n=3)

Only three bifacial artifacts can be definitely identified as projectile points. Of these, two are point tips which are triangular in outline. One projectile point (Fig. 122b) is a triangular corner-notched or expanding-stemmed. This artifact has a longitudinal fracture, and attempts were made to resharpen it.

Biface Knife (n=1)

A thick tabular flake of Winterset chert exhibits a bifacially flaked edge (Fig. 122e). Intermittent attrition wear and light step fracturing indicates likely use as a heavy duty cutting implement.

Biface Scraper (n=1)

One biface exhibits lateral step fractures, which are interpreted to represent scraping wear. This tool exhibits irregular primary flaking. There is a lack of marginal retouch or edge wear. Four biface fragments measure under one cm in thickness. These fragments exhibit patterned primary flaking and may have been used as projectile points or as knives.

Marginally Retouched Tools

Seventy percent of the chipped stone tool assemblage consisted of unifacially edge-modified flakes. Forty-eight percent of these tools were made of blue Winterset, and 52 percent were tan Winterset chert. Eight flakes exhibit heat discoloration.

Scrapers (n=4)

Four flakes exhibit at least one lateral edge with extensive step fractures that are interpreted as scraping wear (Fig. 122c,f). Three tools exhibit only scraping wear, while the fourth exhibits accessory edge attrition.

Edge-Modified Flakes (n=28)

These tools have one or more modified edges or retouched margins; descriptive data for them is presented in Table 60. Eleven tools have concave areas. Twenty-six have straight to convex margins. These tools probably served to cut and scrape materials (Fig. 122a,g-i), were fortuitously used, and then discarded. Although several flakes showing marginal retouch possessed sharp projections, none of these had apparently been used as perforating, engraving, or incising tools for working wood or bone.

Table 59 . Descriptive data for bifacial tools recovered from 23JA104.

CATALOG NUMBER	TOOL TYPE	PROVENIENCE	SURFACE DEPTH	RAW MATERIAL*	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm)		
							Length	Width	Thickness
103	Projectile Point	E574N580	17	BWS		2.3	-	1.8	.6
155	Projectile Point	E575N579	24	BWS		9.7	4.8	-	.7
A-19	Projectile Point	Area 1	Surface	BWS		6.0	-	2.1	1.0
128	Biface Scraper	E574N581	19	BWS		17.2	4.5	3.0	1.3
123	Biface	E574N580	44	BWS		47.2	5.5	4.2	2.7
79	Biface Fragment	E573N582	27	TWS		29.0	-	4.8	1.6
107	Biface Fragment	E574N580	30	TWS		5.5	4.2	-	.7
96	Biface Fragment	E574N579	20-30	TWS	+	.9	-	-	.7
178	Biface Fragment	E575N580	30-40	TWS	+	3.8	-	-	.9
168	Biface Fragment	E575N579	46	TWS		18.5	-	4.4	1.4
427	Biface Fragment	E587N610	30-40	Exotic		.9	-	-	.5

*Raw Material: (BWS) Blue Winterset, (TWS) Tan Winterset

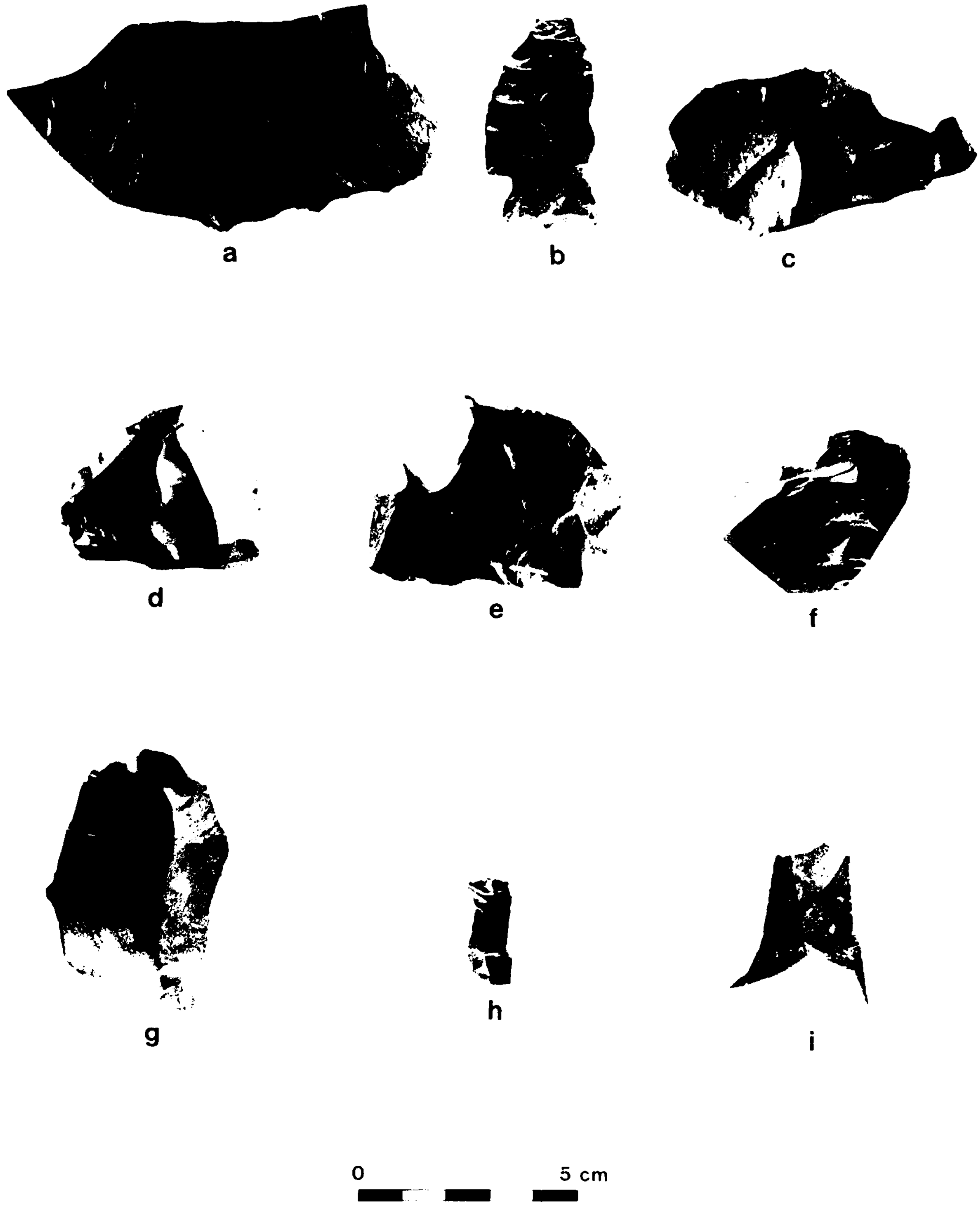

Figure 122. Artifacts from 23JA104: (A, g-i) edge-modified flakes, (b) projectile point, (c, f) scrapers, (d) cores, (e) biface knife.

Lithic Manufacturing Debris

The lithic manufacturing debris from Mouse Creek consists of cores, waste flakes and shatter, all of blue and tan Winterset cherts. Small resharpening flakes and shatter were the only cultural artifacts recovered in the flotation samples. These artifacts were concentrated in Block B, primarily Unit E574, N580 at a depth of 50 cm. Such remains were present, but rare in Block A.

<u>Cores</u> (n=2)

Two tan Winterset cobbles were recovered, one in Block B (Fig. 122d) and one in a test unit. These artifacts show the presence of striking platforms and flake removal surfaces. Descriptive data for the cores is summarized in Table 61. One core is prismatic in outline and the other tabular. Both have cortex present on one surface. Neither has been heated.

<u>Flakes and Shatter</u> (n=496)

A total of 496 unidentified flakes and angular pieces of chert were recovered from the site. There are approximately equal numbers of blue and tan Winterset chert.

Ground Stone Tools

Several ground stone tools were recovered in Block A, Block B, and one test unit at 23JA104. One tool was made from a local iron rich Wea shale piece and five were fine-grained micaceous sandstones not indigenous to the Mouse Creek vicinity.

<u>Mano</u> (n=1)

One 9.2 by 5.1 by 3.3 cm sandstone tool fragment exhibited a flat surface thought to be used as an abrasive used to grind seeds (Fig. 121d). By the use of light diffraction, a linear groove was noted, indicating that the tool was also used to sharpen bone, antler, or wood implements.

<u>Nutting Stones</u> (n=2)

Two tools, one of shale and one of sandstone, were recovered which exhibited pits on one of their surfaces (Fig. 121b-c). The sandstone specimen was fragmentary, yet exhibited three pits which respectively measured 3.7, 2.9, and 2.9 cm in diameter and 1.1, 0.7, and 0.7 cm in depth. The shale tool was a complete slab 11 by 10 by 3.5 cm with one pit 3 cm in diameter and 0.8 cm deep. Possible functions for these tools include nut cracking, use as anvils, or in some type of bone, antler or wood tool manufacturing process.

<u>Sandstone Fragments</u> (n=3)

Three fragments of fine-grained micaceous sandstone were recovered at Mouse Creek. These specimens may have served as abraders, either in mineral pigment preparation or manufacture of wood, bone, or antler tools. None exhibited wear patterns.

Minerals

Minerals recovered include 14 fragments of hematite; these may have been used to produce paints or pigments. However, all specimens were unworked and

Table 60. Descriptive data for edge-modified flakes at 23JA104.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	RE-TOUCHED	EDGE SHAPE AND WEAR**			WEIGHT (g)	DIMENSIONS		
					Convex-Straight	Concave	Heat Dis-coloration		Length	Width	Thickness
274	E584N574	10-20	BWS	+	1A, 1S			31.8	6.7	4.9	1.0
344	E585N611	0-20	TWS			1A		1.0	2.5	1.1	.4
264	E584N573	20-30	BWS		1A			10.3	3.7	1.5	1.5
296	E584N612	20-30	TWS	+	2S		+	29.9	6.9	4.2	1.8
328	E584N615	20-30	TWS		1A	1A		2.4	2.2	2.4	.6
337	E585N610	30-40	TWS		1A	1A	+	5.2	3.9	3.1	.6
378	E585N613	30-40	BWS		1A			5.1	3.8	2.4	.9
302	E584N612	40-50	BWS		3A			20.2	7.7	2.8	1.5
366	E585N612	40-50	TWS		1A			29.4	6.0	4.8	1.3
375	E585N613	40-50	BWS		1A	1A		13.7	5.6	4.1	1.3
29	E573N579	0-20	TWS		1A	1A	+	1.5	1.8	1.7	.5
58	E573N581	0-20	BWS		1A	1A		2.6	1.6	1.6	.4
75	E573N582	0-20	TWS	+	2A			12.3	3.6	3.0	1.0
91	E574N579	0-20	TWS		1A		+	9.5	3.7	4.5	.7
65	E573N581	20-30	TWS		1A	1A	+	4.3	2.6	2.5	.7
94	E574N579	20-30	BWS		2A			5.5	3.2	2.6	.7
97	E574N579	20-30	TWS	+	3A			20.2	4.6	3.3	1.3
131	E574N581	20-30	BWS	+	1S			49.5	9.5	4.5	1.0
191	E575N581	20-30	BWS		1A			4.6	4.2	5.2	.8
113	E574N580	30-40	TWS		2A		+	7.7	4.9	2.7	.8
177	E575N580	30-40	TWS			1A	+	1.2	3.1	1.9	.3
179	E575N580	30-40	BWS			1A		7.8	4.5	5.3	.5

(continued)

*Material type: (BWS) Blue winterset, (TWS) Tan winterset
**Edge wear: (A) Attrition, (S) Step fractures

Table 60 . Descriptive data for edge-modified flakes at 23JA104.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	RE-TOUCHED	EDGE SHAPE AND WEAR** Convex-Straight	Concave	Heat Dis-coloration	WEIGHT (g)	DIMENSIONS Length	Width	Thickness
86	E573N582	40-50	BWS		2A	1A		11.0	3.7	4.8	.8
87	E573N582	40-50	TWS		1A			8.3	7.0	2.1	.9
161	E575N579	0-50	TWS		4A			6.6	3.4	4.1	.8
166	E575N579	40-50	TWS		3A		+	19.1	5.9	3.8	.8
182	E575N580	40-50	TWS		1A			4.0	2.4	2.4	.7
148	E574N582	40-50	TWS	+	2A			10.5	3.7	3.2	.9
421	E587N610	0-20	BWS		1A	1A		2.2	2.4	2.5	.4
424	E587N610	20-30	BWS		1A	1A		7.7	3.7	3.4	.8
429	E587N610	40-50	BWS		1S			36.5	4.0	5.0	2.1
439	E625N580	40-50	BWS		1A			8.2	3.8	2.5	1.9

*Material type: (BWS) Blue winterset, (TWS) Tan winterset
**Edge wear: (A) Attrition, (S) Step fractures

Table 61. Descriptive data for cores recovered from 23JA104.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX PRESENT			WEIGHT (g)	DIMENSIONS		
				Absent	<50%	>50%		Length	Width	Thickness
269	E584N574	0-20	TWS		+		50.5	4.8	4.0	3.7
435	E625N580	20-30	TWS		+		34.0	5.3	4.0	2.0

*Material type: (TWS) Tan winterset

may have been incidental inclusions in the alluvial deposit upon which the site was located. Many small mineral concretions were recovered in the flotation samples.

Forty-six percent of the artifacts recovered at 23JA104 were unworked and unheated stones. These stones may have been deposited at the site during floods or may have been used as hearthstones.

Organic Remains

Two unidentifiable carbonized nut hulls were recovered in Block A. One bone fragment was recovered in Block A, and one in a terrace test unit. These remains were the only organic debris recovered at the site which probably represent prehistoric foods, even though one nut hull and one bone were recovered in the plow zone.

One uncarbonized walnut and one uncarbonized hickory nut were recovered in the plow zone. These were undoubtedly recent intrusions into the soil. Uncarbonized seeds and plant remains were common in all flotation samples.

Historic Artifacts

Historic artifacts were recovered throughout the site, primarily in the plow zone, but occurred as deep as 20-30 cm in Block A and 40-50 cm in one terrace test unit. These artifacts included coal, glass, a porcelain fragment, and machine cut and wire nails. These artifacts may have been derived from an unreported tenant house or other type of historic structure at the site.

Flotation Sample

Standard four liter flotation samples were systematically taken from the excavation units in the two block excavations at Mouse Creek. Units were selected according to a checkerboard sampling strategy. A sample from each 10 cm level within the selected units was then floated, excluding the 10-30 cm plow zone. Twenty-seven samples were floated.

The 30-40 cm and 40-50 cm levels contained predominantly uncarbonized seeds, plant stems, grass fibers and root hairs in all units sampled. In addition two beetles, several gastropods, and a limited amount of lithic debitage were recovered.

The seeds recovered in the flotation sample are interpreted as being intrusive into the archaeological deposit at the site. The large amount of uncarbonized plant remains indicates that ongoing biological processes such as rodent and insect tunnelling have introduced these seeds deeply into the site. No cultural features were encountered which contained sealed and preserved prehistoric food remains.

Several samples of representative seeds were selected for analysis to determine the species present. As these seeds are not prehistoric, it was deemed unnecessary to identify all samples. Uncarbonized plant remains include Elymus sp. (wild rye), Aesculus glabra (Ohio buckeye), Amaranthus sp., Portulaca mundala (purslane), Veronica peregrina, Muhlenbergia sp., Panicum sp., and Ammannia sp. Numerous small unidentified round seeds were present. A small percentage of these seeds produce carbon smears and can be crushed. These were the only carbonized remains and are apparently intrusive.

DISCUSSION AND INTERPRETATIONS

The Mouse Creek site, 23JA104, is located near the upper drainage of the Little Blue River. The site is situated on a low terrace in a meander loop of the upper Mouse Creek. Local tan and blue Winterset cherts are available from the hill slopes. The prehistoric vegetation of the area was composed of a narrow zone of slope-upland forest along the valley wall, with some flood plain plant species along the creek. Upland prairie dominated the surrounding landscape.

The ceramic assemblage recovered from the site is typical of the Middle to Late Woodland periods. The grit and sherd temper and everted rim, globular vessel have been identified in this temporal context in the Kansas City Region (Shippee 1967, Martin 1976, Reeder 1978). The grit tempering material is primarily quartz and metamorphic sands which can be found in the glacial till deposits of the region, in eroded slopes and creek beds that have been cut through glacial morraines paralleling the Missouri River (Shippee 1967:4). They are not found in the vicinity of 23JA104. In one sherd, the presence of mineral concretions typical of the terrace deposits at the site may indicate the use of local silty clays in the manufacture of some of the pottery, although such concretions are widespread in the region.

One diagnostic corner-notched projectile point is a type similar to the Woodland Manker form which dates between A.D. 1 and A.D. 350 (White 1968:71-72, Bell 1976:34). This point was broken during use and attempts were made to resharpen it.

Lithic concentration indices, calculated by dividing the excavation area by lithic artifact totals, indicate differential use of the site in the production of stone tools. Block B has an artifact concentration index of 47 and is interpreted as an area of extensive stone tool manufacture. Block A has a concentration index of 17.3, and the test units have a 10.2 concentration index.

Ground stone tools and minerals were distributed rather evenly throughout the site. Historic remains were concentrated in Block A. Plant food processing occurred throughout the site. Minerals may have been raw material for the manufacture of paint or pigment. Conversely, these minerals may be natural by-products from the weathering of limestone geologic strata in the area.

Although the artifact sample from the site is small, it represents a relatively homogeneous collection dating to the latter part of the Middle Woodland period (A.D. 1-400). Earlier cultural components were reported from surface investigations at the site (Heffner 1975; Brown 1977), but no evidence for these occupations was recovered in our investigation. The area encompassed by the Woodland occupation is estimated at approximately 3800 sq m, based on subsurface archaeological evidence. The artifacts from Blocks A and B and the test units on the terrace indicate a short time span and can be treated as the products of one culture. Based on the relative scarcity of complete tools and slight development of an occupational midden, the site represents a short term, possibly seasonal, habitation. Apparently, those tools that required intensive labor in manufacture were curated by the site inhabitants and were taken with them when they left the site.

Distinct activity areas are evident in the 1979 excavations. Block B was an area of lithic manufacturing, as evidenced by the recovery of many small resharpening flakes. The vast majority of bifacial tools were recovered in Block B, primarily between 20 and 40 cm below the ground surface. Although several lithic tools were recovered in Block A, the most significant artifacts recovered there were pottery sherds, possibly indicating food processing activities in this area. The one rim sherd that was recovered at the site was extremely large relative to the other ceramic sherds and was recovered at a depth of 44 cm near the base of the occupational midden. This artifact had undergone little subsequent breakage due to cultural activities or trampling after it had been initially broken. This may indicate rather rapid burial of the artifact or abandonment of the living surface upon which it was deposited. The ground stone mano and nutting stones indicate that food processing activities and manufacture of wood, bone and antler tools occurred throughout the site.

The results of the investigation at Mouse Creek (23JA104) indicate that the cultural affiliation and site function within the Middle Woodland settlement pattern is similar to the Woodland component at the Sohn site, 23JA110 (Reeder 1978). Relatively fewer artifacts and artifact types were recovered at Mouse Creek than at the Sohn site. The area of the Woodland occupation at the Sohn site was estimated by Reeder (1978) to be 5000 m^2, only slightly larger than the 3848 sq m determined for the Mouse Creek Woodland occupation.

Site 23JA104 is interpreted to represent a short term, seasonally occupie small village of the late Middle Woodland period. Investigations at the site have revealed that the site fits the pattern typical for sites of this period to be small villages located on small tributary streams often near their sources (Johnson 1976:9).

In summary, the 1979 investigations at Mouse Creek documented the occupation of the site by a Middle to Late Woodland cultural group or groups. The site may have been occupied seasonally for prolonged periods. Ceramics present at the site and the development of an occupational midden indicate some type of habitation at the site. Hunting, plant food processing and stone, wood, and bone tool manufacturing activities are indicated by artifacts recovered from the site. There is considerable evidence that the site was occupied by Middle to Late Woodland cultural groups indigenous to the Little Blue Valley.

CHAPTER XII

EXCAVATIONS AT 23JA112

David H. Jurney, Jr.

INTRODUCTION

Site 23JA112 is located on a low alluvial valley bottom in the Little Blue River flood plain south of a confluence of a small tributary stream. The site is in Longview Lake Tract Number 123 (Fig. 123). The site has been leveled by surface contouring for the Longview Lake and will be in the permanent flood pool.

23JA112 was initially recorded by Reid (1975). Surface debris was noted over an area of 4000 sq m along with quantities of alluvially deposited chert and limestone gravel. One small Snyders-like point, one thin biface, and one large biface tip were recovered. These were interpreted to indicate a Middle Woodland cultural affiliation (Reid 1975:55-56). 23JA112 was relocated by Brown in 1976. Several flakes and one Nebo Hill-like point were recovered, suggesting a multi-component Late Archaic and Middle Woodland affiliation (Brown 1977:90). Brown's recommendation for further investigation of the site consisted of extensive excavation (1977:125).

Since 23JA112 fell within the right-of-way for the Longview Lake Sewer Interceptor, the site was later scheduled for testing in 1979 under terms of a contract with the University of Kansas (Wright 1979). Based on the site map and location of the test units, it appears that site 23JA169, located several hundred m north and across an intermittent stream, was tested. Four test units and widely distributed soil probes yielded little subsurface remains at 23JA169, and extensive excavations at this locality were deemed unwarranted (Wright 1979:55). The 1979 excavations at 23JA112 consisted of the hand excavation of test units and a block excavation. Diagnostic artifacts and tools were mapped to the nearest cm. Local sources of chert were investigated and samples taken. Flotation samples were taken to recover micro-scale floral and faunal remains.

ENVIRONMENTAL SETTING

23JA112 is located in the upper Little Blue Valley, approximately 52 km south of the confluence of the Little Blue and Missouri Rivers, on a low knoll

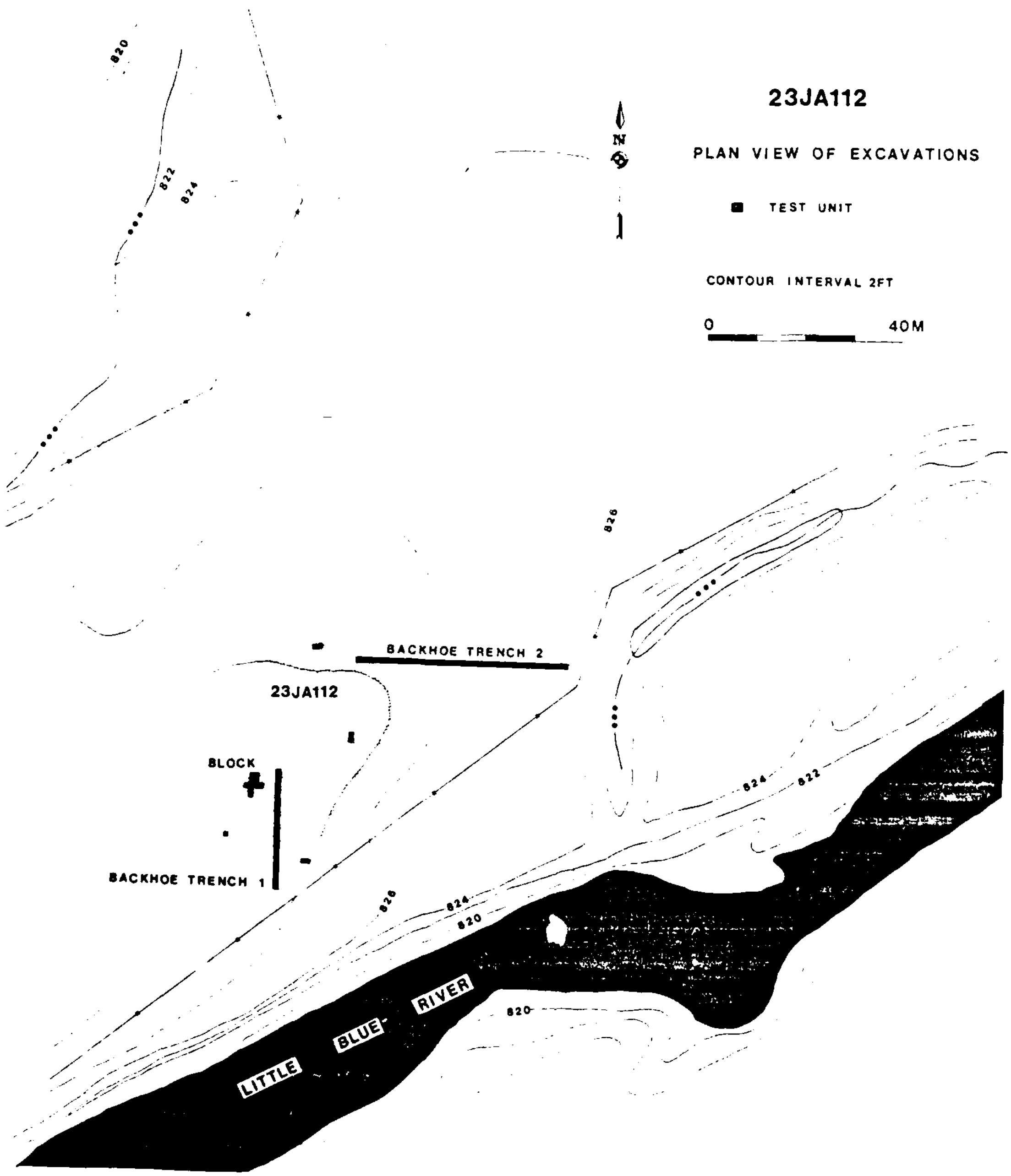

Figure 123. Plan view of excavations at 23JA112.

within the Little Blue flood plain. The valley walls are composed of talus slopes and occasional outcrops of Bethany Falls and the lower Winterset limestones. The flood plain is composed of redeposited shale, chert, and limestone gravel bars and alluvial silt deposits. The local topography is characterized by low seasonally wet areas, the slightly elevated knoll upon which the site is located, a small tributary stream north of the site at the foot of the valley wall, and the meandering Little Blue River south and east of the site (Fig. 123).

The Winterset and Argentine limestones provide locally available chert resources. Tan Winterset chert is the dominant and most readily available lithic resource, derived from the lower Winterset limestone along the upper slopes of the valley. Argentine and blue and tan Winterset cherts are available as stream gravels.

The prehistoric selection for the location of 23JA112 in the flood plain necessitated the consideration of several climatic parameters. The site would have been subject to brief seasonal flooding from March to June. Due to the cold air drainage phenomenon during the cool seasons of the year, the site location would have a high probability of frost and temperature extremes (Decker 1955). The Soil Conservation Service has mapped the soil at 23JA112 as a Kennebec silt loam which is moderately well drained and has formed in a flood plain alluvium.

The United States General Land Office Surveys conducted in 1826 indicate that, at that time, the site was located in a flood plain forest. Interspersed areas of aquatic and lowland prairie zones may have been present but were not mapped or described in the GLO field notes. As the site is located in the center of the flood plain forest near a reliable water source, climatic perturbations would not have significantly altered this vegetation zone during the last several thousand years. The 1826 flood plain forest was composed of dominant white and black oak, linn, pawpaw, hickory, hackberry, walnut, maple, and sycamore. Dense understory vegetation characterizes the flood plain forest. Common animal species included white-tailed deer, turkey, passenger pigeon, squirrel, cottontail, raccoon, opossum, and black bear. Bison and wapiti were seasonally present, but uncommon. Several of these species were known historically to migrate between upland prairie and lowland hardwood environments (McKinley 1960).

The local environment of the site is characterized by the abundance of leafy plant foods in the spring and summer. This season is also characterized by frequent, though brief, floods. The most favorable seasons of the year for occupation of the site are early spring, late summer, and fall. Other considerations may have been the availability of lithic resources and water, demographic arrangement of cultural groups, or procurement of plant or animal foods by specialized work groups.

DESCRIPTION OF THE SITE AND INVESTIGATIONS

The 1979 investigations conducted at 23JA112 by SSI were based on the mitigation recommendations of Brown (1977). These investigations included the

opening of a series of test units to determine the extent of cultural remains, a block excavation in the area of concentrated cultural debris, and two backhoe trenches to check for the presence of buried cultural deposits (Fig. 123). Eight one by one m test units were excavated in the area of surface scatter designated by Reid (1975) as 23JA112. Eleven contiguous units were then excavated adjacent to the unit with the deepest, most concentrated cultural debris (Fig. 124). Trench 1, a 25 m long, 1.5 m deep backhoe trench, was dug to the south through the center of the site. This trench in conjunction with the test units revealed that subsurface cultural debris was distributed in the area shown in Figure 123. Trench 2, a 41 m long, 2.5 m deep backhoe trench, was dug to the east off the knoll (Fig. 123) and within the site area as defined by Reid (1975). This trench indicated the presence of layered gravel deposits throughout the trench profile. Based on this data, this portion of the site as defined by Reid (1975) consists of redeposited cultural material.

All excavation units were hand dug. Flotation samples were taken from each 10 cm level within each one by one m unit in the block excavation.

Extensive cultural remains were recovered within the block excavation to a depth of 65 cm below ground surface. Concentration indices were calculated by dividing the artifact total by the unit volume. These indices indicated variable amounts of cultural debris in the block excavation. Units with more concentrated cultural debris were located in the northern and southern portions of the block. The artifact concentration ranges from 3.2 to .5 with a mean of 1.3. Artifact concentrations vary throughout the stratagraphic profile, with cultural debris more concentrated between 35-65 cm in the northern portion of the block and between 0-20 cm in the southern portion of the block. Cultural remains in the test units along the site perimeter were recovered to a depth of 45 cm below ground surface. Artifact densities vary throughout the site, with artifact concentrations located in the northeast and southeast portions of the site. The test unit artifact concentration ranges from 2.0 to .2 with a mean of 1.1. The block area had the highest artifact concentration. One tree cast was noted in the block excavation and one in Trench 1. No cultural features were encountered. Rodent burrows were present.

Geomorphology and Stratigraphy

The area around 23JA112 is in a portion of the Little Blue River which is characterized by a narrow valley with a shallow depth to bedrock under the flood plain deposits. The stream pattern during the Holocene has been that of a braided stream channel with several bars of coarse gravel remaining as local topographic highs. 23JA112 is located on one of these local highs whose surface has been stabilized during the late Holocene by alluvial silts and clays from overbank floods.

The soil at 23JA112 is listed as belonging to the Kennebec soil series. The Kennebec series is a cumulic hapludoll that is moderately well drained, forming on flood plains from alluvial silts. The upper part of the profile (Fig. 125) is typically a black silt loam with a weak subangular structure to the peds. The lower portion is a very dark gray or very dark grayish brown

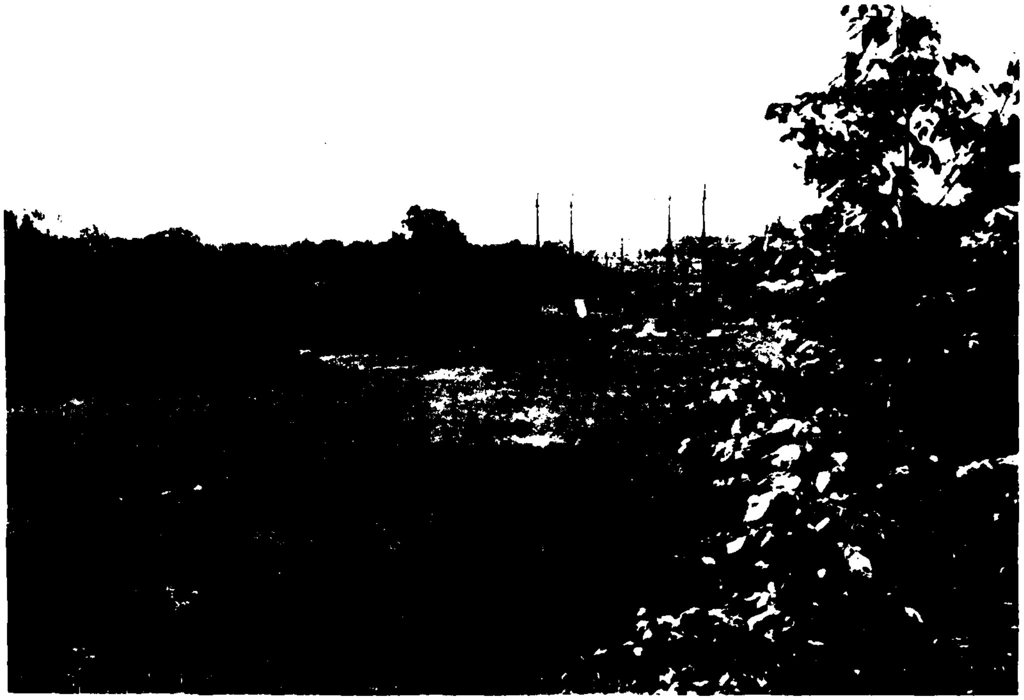

Figure 124. General views of 23JA112. (Upper) General view of site to the south. (Lower) General view of completed excavations at the site.

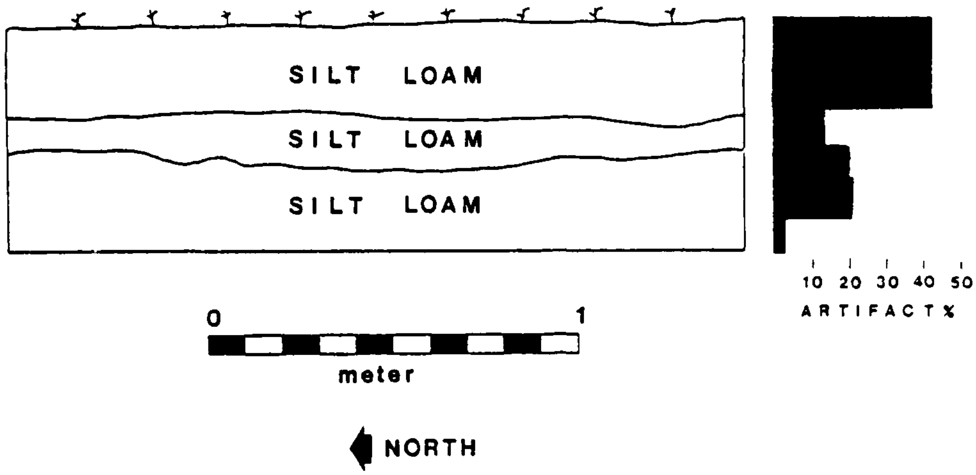

Figure 125. Profile and distribution of artifacts at 23JA112.

silt loam, with equally poor soil structure. Some root casts or crayfish burrows also appear in parts of the profile. Below the silts are gravelly silt loams that are dark brown to dark yellowish brown in color. These gravel layers, G1 through G4 (Fig. 126) represent successive shifts in the channel prior to stabilization of this landform. The historic gravel has truncated portions of the older gravels. The older gravels are themselves a mixture of weathered limestone, local shales and residual cherts in a matrix of ark grayish brown silts. The differentiation of these gravels is based on contrasts in the size and orientation of the larger cobble from one layer to the next. The majority of the cherts were patinated Winterset chert. Very few flakes of fresh chert were observed in any of the gravel layers. Some of the chert in these layers is presumed to be from Argentine limestone which crops out further up the valley.

THE ARTIFACT ASSEMBLAGE

A total of 1161 artifacts were recovered during the 1979 investigations conducted by SSI at 23JA112. The artifact assemblage recovered from the block excavation, test units and backhoe trenches at the site included chipped and ground stone tools, lithic manufacturing debris, charcoal, bone, shell, carbonized seeds, minerals, modern artifacts, and unworked stone. The majority of these remains were recovered from the block excavation. The distribution of artifacts is shown in Table 62. Forty-three percent were recovered in the 0-25 cm plow zone, 13 percent in the 25-35 cm level, 20.5 percent in the 35-45 cm level, 21 percent in the 45-55 cm level, 2.3 percent in the 55-65 cm level,

Table 62. Distribution of artifacts at 23JA112.

	BLOCK EXCAVATION (cm bd)						TEST UNITS (cm bs)				Trench 2		TOTAL
	194 - 220	220 - 230	230 - 240	240 - 250	250 - 260	260 - 270	0 - 25	25 - 35	35 - 45	Trench 1		Surface	
CHIPPED STONE TOOLS													
Projectile Points	1		2										3
Biface												1	1
Edge-Modified Flakes	11	6	17	10									44
Total	12	6	19	10								1	48
MANUFACTURING DEBRIS													
Debitage	89	69	123	127	12	1	30	2		17	4	1	475
Chunk	2	1	1	1	1		2						8
Shatter	3		4	2				1					10
Cores			2	2			1						5
Total	94	70	130	132	13	1	33	3		17	4	1	498
GROUND STONE					1				1				2
MINERAL				3	1	1	3	8	3				19
FAUNAL REMAINS													
Bone	1	1	1	1	2								6
Shell										2			2
Total	1	1	1	1	2					2			8
CHARCOAL			1	1	1						3		6
UNWORKED STONE	171	33	53	85	8		154	22	15	30	1		572
MODERN MATERIAL	8												8
TOTAL	286	110	204	232	26	2	190	33	19	49	8	2	1161

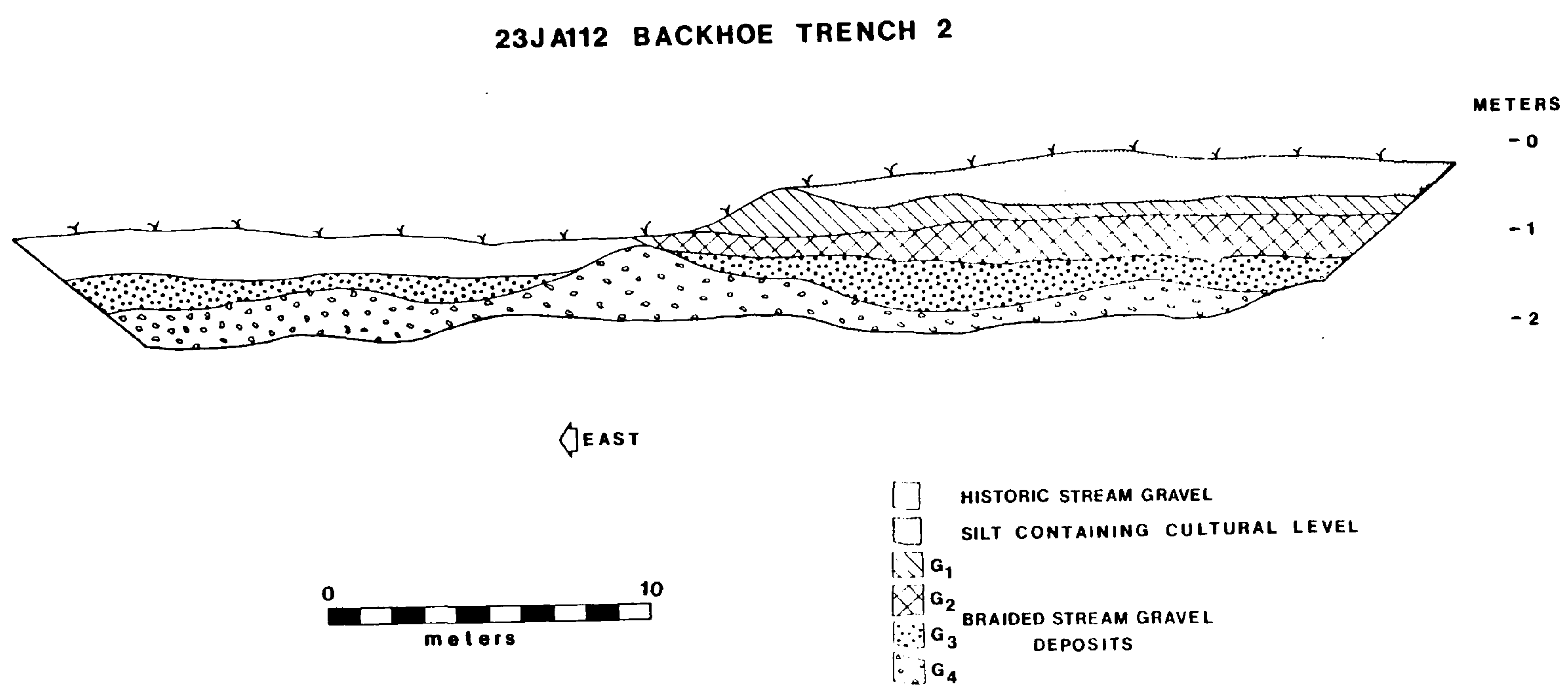

Figure 126. Profile of Backhoe Trench 2 illustrating major depositional units at the site.

and only 0.2 percent in the 65-75 cm level. The cultural deposit at 23JA112 is characterized by a relatively thick, homogenous accumulation of cultural debris. No habitation levels were distinguished during the field investigations.

Chipped Stone Tools

The chipped stone tools are made from a variety of chert materials. These cherts are primarily local tan and blue Winterset cherts. One unidentified white chert type is present, possibly derived from Mississippian geologic strata in central Missouri.

Bifacial Tools

This group of artifacts have been manufactured by percussion and pressure flaking of both faces, and include three projectile points and a large biface.

Projectile Poi 'n=3)

Three pro ie points were recovered at the site. Two are made of unidentified c ..s and one of blue Winterset.

Two complete points were recovered from the 35-45 cm level in the block area. One point is a large corner-notched dart point made of blue Winterset chert (Fig. 127a). This point has a resharpened tip and a broad triangular blade. The second complete point (Fig. 127b) is a small corner-notched dart point made of an unidentified white chert, possibly derived from the Mississippian strata of central Missouri. This point also has a delicate resharpened tip, and the blade has been resharpened to an irregular triangular outline. The third projectile point (Fig. 127c) is a small corner-notched arrow point with a broken tip and base, and made from an unidentified brown chert. It was recovered from the plow zone in the block area.

The large dart point resembles the Steuben Expanded Stemmed type which dates from the Middle to Late Woodland periods. The small dart point resembles the Late Woodland Kings Corner Notched type. The arrow point resembles a Scallorn type which dates from the Late Woodland to Early Mississippian periods (Chapman 1980). These three projectile point types have been recovered in association at a number of Middle and Late Woodland archaeological sites in the Northwest and Western Prairie regions of Missouri, including rock shelters and open sites in the Pomme de Terre, Truman, Stockton, and Hackleman Corner Reservoirs (Chapman 1980).

Bifacial Knife (n=1)

One large bifacial tool, basally broken, which may have functioned as a knife was recovered from the surface (Fig. 127d). This artifact is made of locally derived tan Winterset chert. This tool weighs 21.8 g and is 3.8 cm wide and .9 cm thick.

Unifacial Tools

This group of artifacts consists of edge-modified flakes. These tools show edge damage and retouch along one or more lateral margins. Several specimens exhibit distinctive wear patterns.

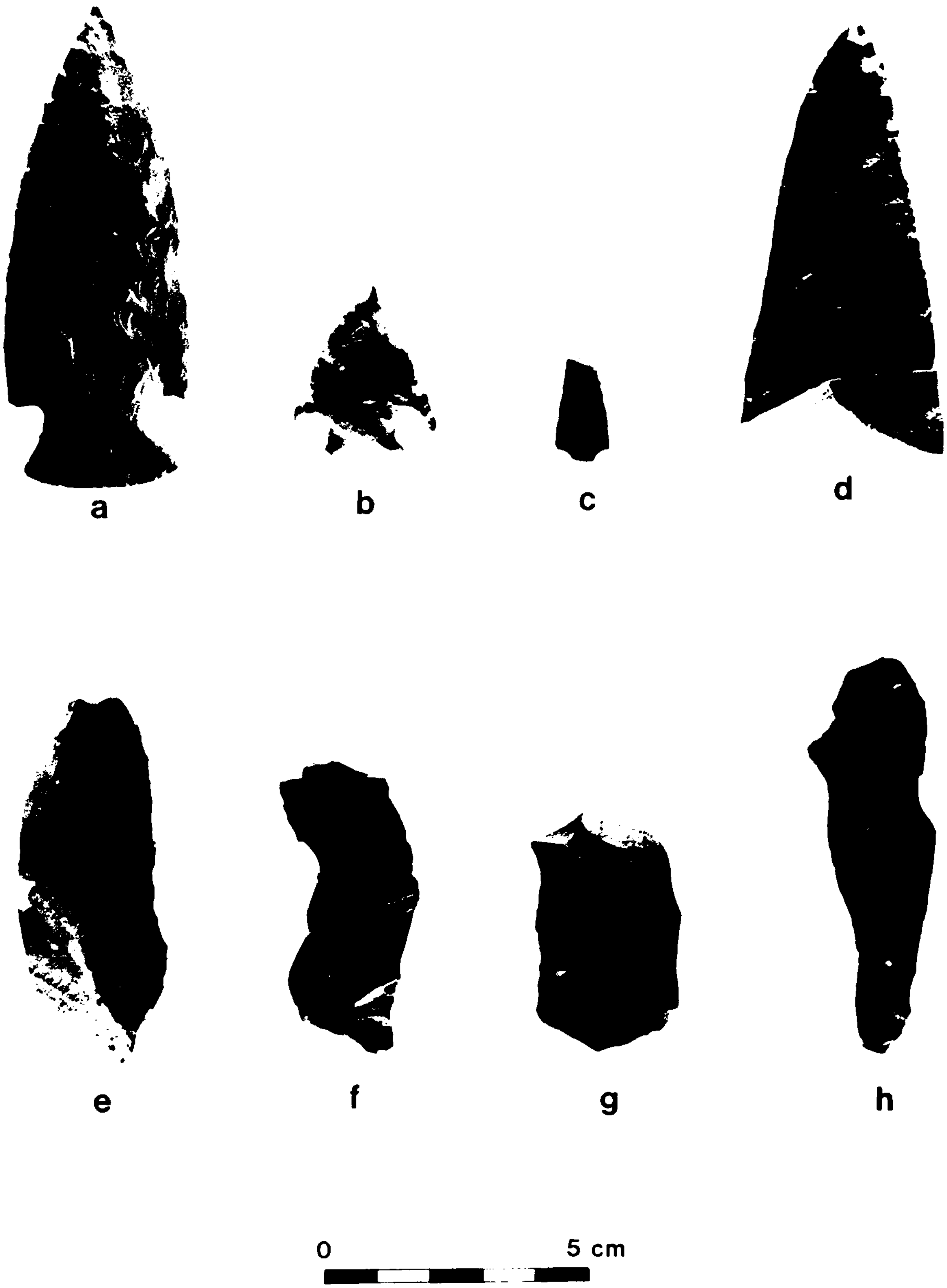

Figure 127. Chipped stone tools from 23JA112: (a-c) projectile points, (d) bifacial knife, (e-h) edge-modified flakes.

Edge-Modified Flakes (n=44)

Forty-four flakes exhibit edge-modification as a result of tool use. Nineteen flakes show a continuous series of retouch along at least one-third of a flake margin (Fig. 127e-h). The original flake shape is not significantly altered on any of the edge-modified flakes.

Inferred functions for these tools include scraping, engraving and cutting of wood, bone, or other materials. Various combinations of these wear types are found on individual flake tools (Table 63). Scraping wear is exhibited on 16 tools, defined by areas showing retouch and step fractures. Engraving wear is exhibited on eight tools, defined by areas showing retouch associated with a flake edge or projection. Cutting wear is present on one tool. This flake exhibits feather flakes and edge-dulling. Nine specimens are heat discolored.

Statistical data for the edge-modified flake assemblage are shown in Table 64. Width and thickness are the most uniform variables. No significant difference was observed within the stratigraphic levels at the site.

Manufacturing Debris

Debitage (n=493)

A total of 493 pieces of chert debris which are the by-products from tool manufacture were recovered. Unworked flakes comprise 96 percent, shatter three percent, and chunks one percent of this assemblage. Blue Winterset chert comprises 12 percent, tan Winterset 87.8 percent and unidentified chert 0.2 percent of this assemblage. Twenty percent of the tan Winterset flakes exhibit heat discoloration.

Cores (n=5)

This group of artifacts consists of tabular chert forms which exhibit platform preparation and the removal of flakes. Descriptive data are presented in Table 65. These chert forms all occur locally (Fig. 128a-e). Four specimens were tan Winterset and one blue Winterset. None exhibit heat discoloration.

Ground Stone Tools

Ground stone tools from 23JA112 are made from micaceous sandstones which were probably collected from glacial till along the Missouri River trench. Two fragmentary specimens exhibiting ground surfaces were recovered. These specimens were likely fragments of larger tools used in the processing of plant foods. The larger specimen (Fig. 129b) weighs 82.4 g and is 2.2 cm thick. The other specimen (Fig. 129a) weighs 61.0 g and has a thickness of 2.8 cm.

Faunal Remains

Six fragments of unworked bone were recovered. One proximal end of a left radius and one right maxillary second molar of Odocoileus virginianus were identified. One fragment of tooth cementum, two long bone splinters and

Table 63. Descriptive data for edge-modified flakes at 23JA112.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH (cm)	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex-Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Width	Thickness
11	E488,N499	213	TWS	1	2A, 2P		-	1.3	2.6	1.4	.4
33	E488,N500	194-220	TWS	1	1A		-	12.0	5.0	3.3	.9
54	E489,N498	194-220	TWS	-	1A,R		+	1.9	2.3	1.7	.5
75	E489,N499	194-220	TWS	1	1A,R		-	11.6	4.0	5.2	.9
95	E489,N500	194-220	TWS	4	1A,R	1A,R	-	23.5	7.2	3.4	1.1
111	E489,N501	198-210	TWS	-	1A		-	1.5	2.8	2.6	.3
151	E490,N500	200-210	TWS	-	1A,1P,R	1A,R	+	14.3	5.7	2.6	1.3
176	E490,N501	197-220	TWS	1WX	1A,R		+	3.5	2.5	3.0	.7
177	E490,N501	213	TWS	1	1A	1A	+	11.0	2.9	3.8	1.1
192	E490,N502	197-220	TWS	1WX	1A,R,P		-	2.8	2.9	2.4	.6
212	E491,N500	200-210	TWS	2		1A	-	3.7	2.1	2.6	1.1
135	E489,N502	220-230	BWS	-	1A,R		-	1.9	3.1	1.8	.5
136-1	E489,N502	220-230	TWS	3		1A	-	4.7	4.3	3.8	.6
136-2	E489,N502	220-230	TWS	-	1A		-	1.1	2.5	1.7	.3
138	E489,N502	220-230	TWS	-	1A		+	3.5	2.7	3.0	.6
20	E488,N499	230-240	TWS	3	1A		-	1.8	2.1	2.1	.6
40	E488,N500	230-240	TWS	1WX	1A		-	4.3	3.3	2.2	.6
41	E488,N500	239	TWS	-	1A	2A	+	14.7	6.5	3.8	.8
84	E489,N499	230-240	TWS	1	1A		-	2.3	2.1	2.9	.8
101	E489,N500	230-240	TWS	-	1A		-	4.3	3.6	3.4	.5
121-2	E489,N501	230-240	TWS	-	1A	1A	-	1.0	2.7	1.9	.4
121-3	E489,N501	230-240	TWS	-	1A		-	1.5	1.9	2.2	.5
142-1	E489,N502	230-240	TWS	1		1A	-	2.0	3.0	2.0	.4
142-2	E489,N502	230-240	TWS	1	1A,P		-	.4	1.5	.9	.4
156	E490,N500	230-240	TWS	1	1A,R		-	2.5	3.7	1.7	.5
181	E490,N501	230-240	TWS	1	2A		-	6.2	3.9	2.9	.6
197	E490,N502	230-240	BWS	-	2A,1P		-	1.1	2.1	1.6	.4
198	E490,N502	230-240	TWS	1		1A	+	2.8	3.6	1.7	.6
199	E490,N502	230-240	TWS	1	1A,R,S		-	2.0	2.4	2.3	.4
200	E490,N502	230-240	TWS	2	2A,1A,E		+	10.3	7.5	2.3	1.0

(continued)

Table 63. Descriptive data for edge-modified flakes at 23JA112.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH (cm)	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex-Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Width	Thickness
201-3	E490,N502	230-240	TWS	1WX,2	1A		-	10.6	7.5	2.3	.6
201-5	E490,N502	230-240	TWS	-	1A		-	.9	1.7	2.1	.3
202	E490,N502	230-240	TWS	1WX	1A	1A	-	2.0	2.9	1.9	.5
203	E490,N502	235	TWS	1	1A,R	1A	-	15.2	7.0	2.8	.9
25	E488,N499	240-250	TWS	-	1A,P		-	.4	1.2	1.4	.2
26	E488,N499	240-250	TWS	1	1A,R		+	6.9	4.5	3.5	.5
69	E489,N498	241	BWS	1	1A,R		-	8.2	2.6	3.4	1.2
70	E489,N498	246	TWS	1	1A,1A,P		-	8.5	4.6	2.8	.8
124-3	E489,N501	240-250	TWS	1	1A		-	1.6	2.8	2.5	.3
126	E489,N501	240-250	TWS	-		1A,S	-	1.0	2.1	2.0	.4
184	E490,N501	240-250	TWS	1	1A		-	8.2	4.0	3.5	1.1
185	E490,N501	240-250	TWS	3	1A,R		+	3.5	1.9	3.6	.8
220	E491,N500	240-250	TWS	1	1A,R,1A		-	3.5	3.8	1.9	.8
243	E501,N529	240-250	BWS	1WX	1A,R,P		-	12.7	4.5	2.5	1.1

*Material type: (TWS) Tan Winterset, (BWS) Blue Winterset
**Cortex: (WX) Weathered
***Edge-modification: (A) Attrition, (R) Retouch, (S) Step flake, (P) Projection

Table 64. Statistical data for the edge-modified flake assemblage of 23JA112.

	WEIGHT	LENGTH	WIDTH	THICKNESS
Number	44.0	44.0	44.0	44.00
Mean	5.5	3.5	2.5	.7
Standard Deviation	5.2	1.6	.8	.3
Variance	26.8	2.6	.7	.08

a skull fragment were unidentifiable large mammal bones, probably white-tailed deer. The radius and molar were recovered in the 0-25 cm level, one fragment in the 25-35 cm level, and one in the 55-65 cm level. All these specimens represent food remains.

Shell (n=2)
Two unionid mussel shells were recovered in Trench 1. These specimens may represent food remains or natural deposits in the alluvium.

Other Classes of Material

This artifact class consists of inorganic debris not specifically designed as tools. Artifact categories include minerals, unworked stone, and modern materials.

Minerals (n=19)
This artifact category consists of small pieces of unworked minerals. One piece of hematite and 18 chunks of limonite were recovered. Both minerals probably occur within the limestone bedrock of the area. These specimens may have been collected and brought to the site for use in paint or pigment manufacture.

Unworked Stone (n=565)
This material consists of small chert and limestone pebbles naturally occurring as stream gravel.

Modern Materials (n=8)
Six fragments of barbed wire, an aluminum pop-top, and a plastic shotgun cap were recovered in the 0-25 cm level of the block excavation. These materials were intrusive.

Table 65. Descriptive data for cores at 23JA112.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH (cm)	MATERIAL TYPE*	CORTEX SURFACES	HEAT DISCOLORATION	WEIGHT (g)	DIMENSIONS (cm)		
							Length	Width	Thickness
236	E501,N485	210	TWS	2		163.0	10.2	7.6	2.7
204	E490,N502	231	TWS	4		117.6	6.2	5.5	2.6
21	E488,N499	233	TWS	3		44.4	4.9	4.8	1.8
127	E489,N501	245	BWS	3		157.0	8.5	6.0	2.8
186	E490,N501	245	TWS	3		70.0	6.8	5.0	2.1

*Material type: (TWS) Tan Winterset, (BWS) Blue Winterset

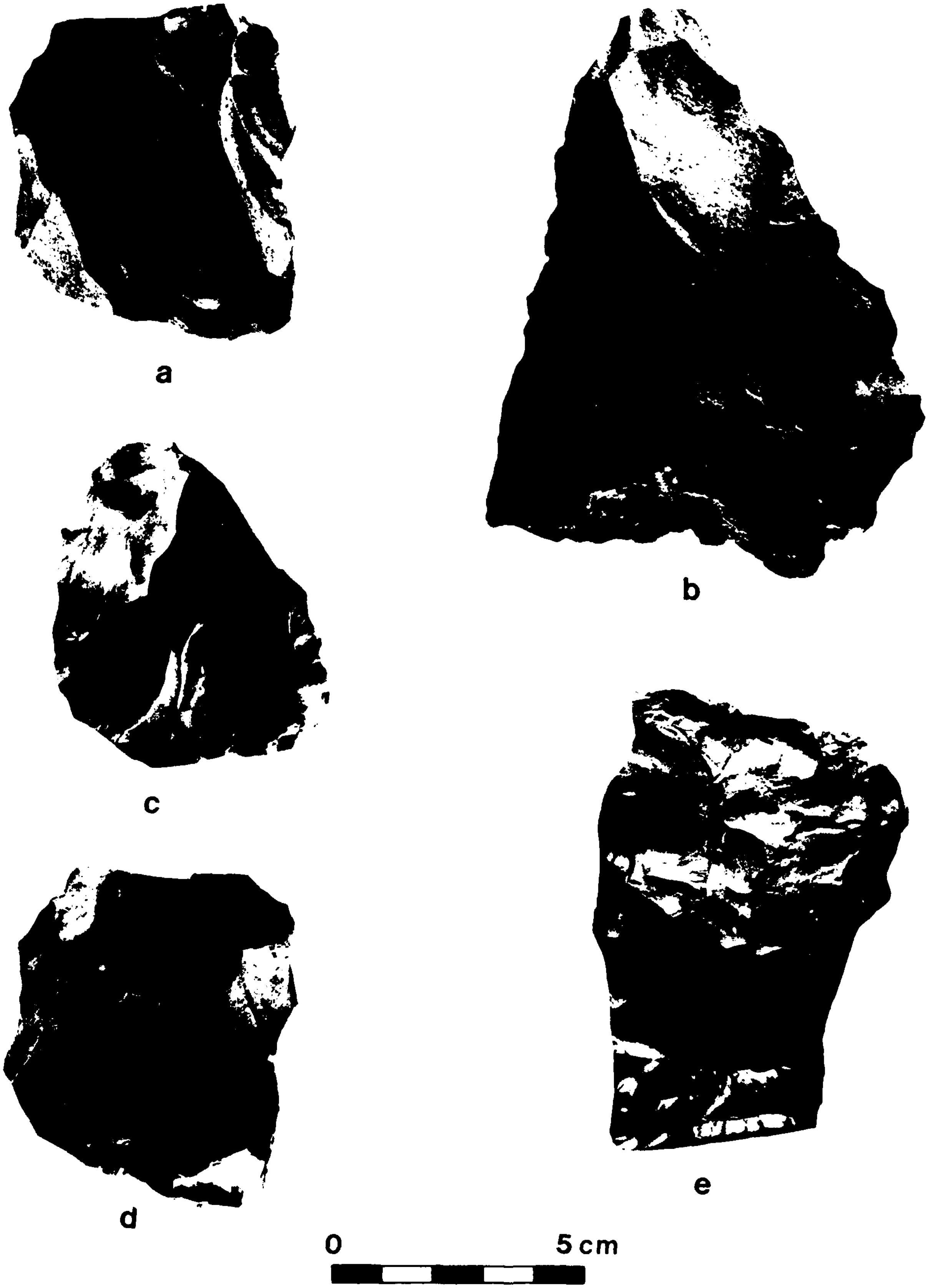

Figure 128. Cores from 23JA112.

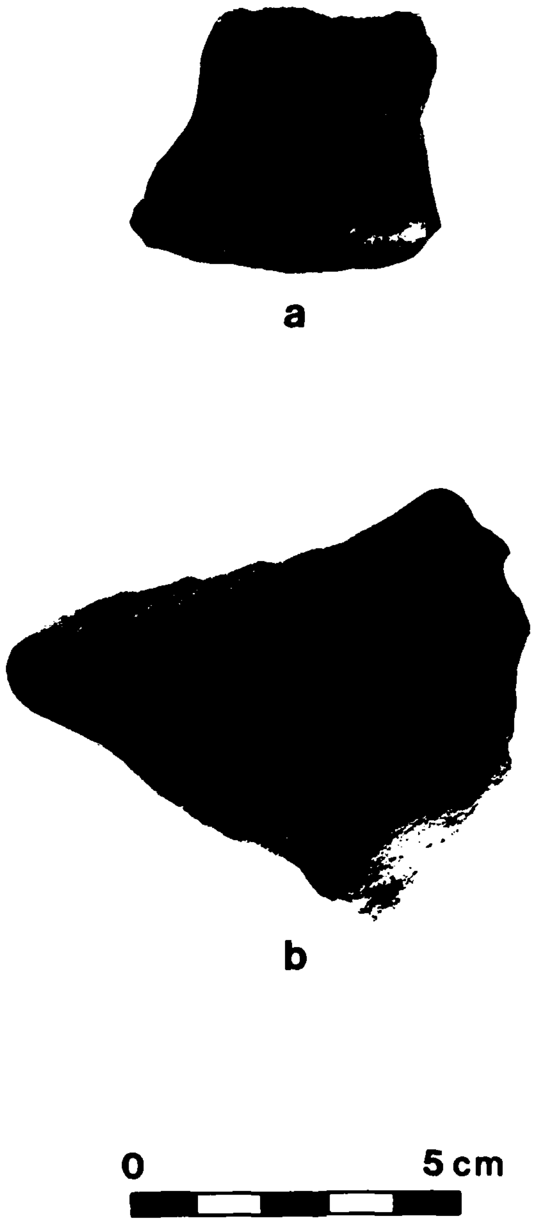

Figure 129. Ground stone tools from 23JA112.

Flotation Sample

Flotation samples were taken from each excavation unit and each 10 cm level at 23JA112. Each sample was a standard 4 liter. A total of 116 liters was floated. Carbonized floral remains were recovered from all units and levels.

Carbonized floral remains were noted as deep as 70 cm below ground surface. Small debitage was also recovered during flotation and sparsely scattered throughout the block and the vertical profile. Bone fragments were recovered in a few samples but were concentrated in the 55-65 cm level. The consistent presence of uncarbonized seeds throughout the profile suggests that many seeds were deposited as a result of natural processes.

Charcoal (n=6)
Six fragments of wood charcoal were recovered during the excavation. Three samples were taken in the block excavation, and three samples were taken in Backhoe Trench 2. This charcoal was insufficiently large for radiocarbon dating.

Identified Plants
Seven species of plants were identified at the flotation sample. Many small unidentified black seeds were also recovered. The identified plants include both carbonized and uncarbonized specimens. Two tree species, *Quercus* sp. and *Carya cordiformis*, pignut hickory, were represented by carbonized nut hulls. The pignut hickory bears a bitter nut and grows in rich alluvial soils along streams. Two plant species, *Amaranthus* sp. and *Chenopodium* sp., were represented by uncarbonized seeds. Both of these plants are common in disturbed alluvial environments. Three species of carbonized plants were present. These were *Panicum* sp. (panic grass), *Sisyrinchium angustifolium* (blue-eyed grass), and *Ammannia* sp. *Panicum* is common in prairies and low-lands. *Sisyrinchium augustifolium* is common in moist woodland soils along streams. *Ammannia* is common along the muddy margins of ponds, sloughs, and streams (Steyermark 1963).

Uncarbonized plant remains were recovered in both the 20-30 cm and 30-40 cm levels. Extremely black or carbonized plant seeds and carbonized nut hulls were recovered in those levels also. Only carbonized and reduced materials were recovered from the 40-50 cm and 50-60 cm levels. The presence of these carbonized and uncarbonized plant remains deep in the site midden may be due to intrusion of seeds or the rapid burial of materials. The carbonized remains may represent plants which were burned as an indirect result of cultural activities at the site. Only the acorn remains have food value, although the pignut hickory may have had medicinal value.

Most of the carbonized plant remains grow naturally at the site and may have originated from cultural activities such as cleaning the site of vegetation by burning. These remains could have then become incorporated into the site midden through natural processes. Conversely, many of the small blackened seeds may be present because of rapid burial and may have undergone a reduced biological decomposition, giving the appearance of carbonization. Fragments of wood, nut hulls, and some seeds are undoubtedly burned.

DISCUSSION AND INTERPRETATIONS

23JA112 was intensively excavated in 1979. A total of 1161 artifacts were recovered during this investigation. The site represents Middle to Late Woodland occupations. An intact, 50 cm thick cultural midden overlain by a 25 cm thick plow zone is present at the site. Based on the uniform soil horizons, the relatively homogenous temporal context of the artifact assemblage, and the presence of preserved floral and faunal remains in the midden deposit, we interpret the site as being built up rapidly by alluvial deposition. The site's location 30 m from the bank of the Little Blue at the outside bend of a meander is conducive to overbank deposition as well as localized scouring. The knoll deposit upon which the site is located was formed relatively rapidly and has encapsulated the prehistoric cultural remains.

Based on the previous descriptions of various chert and sandstone artifacts and organic remains recovered at the site, cultural and subsistence activities can be reconstructed. A study of chipped and ground stone tools and edge-modified flakes indicates hunting and plant processing activities. White-tailed deer and carbonized plant remains were recovered. Flake and bifacial tools were used to cut, scrape, and engrave wood, bone or other materials.

One large projectile point is made of local blue Winterset chert. One small dart point and an arrow point were made of unidentified cherts which may be derived from the Mississippian geologic strata of central Missouri. The lithic tool manufacturing waste and flake and bifacial tools were predominantly local tan Winterset chert. The ready availability of this tan Winterset along the valley slopes accounts for its use in the manufacture of less labor intensive tools such as edge-modified flakes and bifacial knives.

The one recovered arrow point was broken, then discarded. Both dart points have been resharpened, but are complete specimens. The presence of a needle-like tip on these specimens suggests that they had been resharpened but were discarded or lost prior to use. This delicate projection would probably have been broken when penetrating an animal during hunting. The dart points were apparently curated for extended periods of time and resharpened prior to use.

One large biface tip was recovered which was used as a heavy duty butchering implement, based on the edge-wear. This tool broke along a calcite inclusion. Flake tools were probably used in light butchering, and the working of wood or other materials.

Tabular cores are locally derived rock forms used for the extraction of flake tools and the manufacture of bifacial tools. These artifacts range from slightly modified slabs to heavily reduced cores.

Two ground stone artifacts indicate the processing and grinding of plant foods. No mineral stains were noted on the working surfaces, but these stones may also have served to grind limonite and hematite into pigments. These tools were made of non-local sandstone which can be obtained from glacial till deposits along the Missouri River trench.

White-tailed deer remains provide direct evidence for the hunting, butchering, and possible consumption of animal foods at the site. These remains have been splintered as a result of butchering or post-depositional alteration such as scavenging by animals. One deer radius has been heavily gnawed by rodents.

The artifact assemblage at 23JA112 indicates resource procurement activities. Labor intensive tools were curated and maintained for extended periods of time, while tools requiring less work were simply discarded after use. The use of non-local as well as local cherts for the labor intensive dart points indicates some type of inter-regional procurement of stone. The presence of glacial till sandstones indicates group or individual movement or an exchange mechanism among the Woodland inhabitants of the Little Blue Valley.

Based on an analysis of the material cultural remains, 23JA112 served as a specialized resource extraction camp. The lack of pottery in the Middle to Late Woodland context indicates a non-permanent or specialized activity occupation. Plant and animal foods were processed at the site. The presence of complete projectile points suggests that they were discarded or lost prior to or during hunting activities. The site also served to a lesser extent as a tool manufacturing locus.

The nature of the cultural occupation at the site contrasts to the site function noted at the Sohn site, 23JA110 (Reeder 1978), and the Mouse Creek site, 23JA104, both of which are located in the upper Little Blue Valley. These latter sites represent seasonally occupied or semi-permanent village sites. 23JA112 may have served as a resource extraction camp within the settlement-subsistence system of the Middle to Late Woodland inhabitants of the upper Little Blue Valley.

Satellite villages and semi-permanent base camps are represented in the upper Little Blue Valley at the Sohn site, 23JA110, and the Mouse Creek site, 23JA104, during the Middle to Late Woodland periods. It is suggested here that small extraction sites such as 23JA112 were used by indigenous inhabitants of the Little Blue Valley practicing seasonal hunting and foraging subsistence strategies. The depth of the relatively homogeneous cultural deposit at 23JA112, which is located in a rapidly aggrading situation, indicates that the site was periodically used for a significant length of time. This situation would be expected in the case of a seasonal round subsistence strategy practiced by an indigenous cultural group. Long ranging forays from surrounding regions would be expected to leave thinner, less concentrated archaeological deposits than the archaeological deposit investigated at 23JA112.

In summary 23JA112 is a Middle to Late Woodland occupation on a low knoll immediately adjacent to the upper Little Blue River. Subsurface material extends over a 1100 sq m area. The cultural deposit extends to a depth of 75 cm. No cultural features were encountered. Including all the excavation units and the backhoe trenches, approximately four percent of the site has been excavated.

23JA112 is interpreted to represent a seasonally occupied extractive site used during the Middle to Late Woodland period. Cultural material and subsistence remains support this interpretation. The site is significant in terms of its relationship to larger, more permanent Middle to Late Woodland sites in the upper Little Blue Valley. 23JA112 served as an extractive locus used by the Middle to Late Woodland occupants of the valley who were practicing a seasonal round subsistence strategy, or maximizing subsistence efforts by dispersing hunting and gathering groups within a limited territorial range.

CHAPTER XIII

EXCAVATIONS AT 23JA170

David H. Jurney, Jr.

INTRODUCTION

This report describes the results of extensive excavation at 23JA170. The site is located on Longview Lake Tract Number 125. The site is situated on an upland ridge and covers approximately 15,000 sq m (1.5 ha). This south trending ridge overlooks an acute bend in the deeply cut Little Blue Valley (Fig. 130). 23JA170 is located within a proposed recreation area of the Longview Lake Project and may be extensively damaged by future recreational development.

Test excavations at 23JA170 in 1976 indicated the presence of a single Late Archaic Nebo Hill complex component (Brown 1977). The test excavations recovered a range of stone tools typically associated with Nebo Hill base camps. The site was interpreted as a predominantly tool manufacturing locus with hunting, butchering and hide working activities represented by particular types of artifacts (Brown 1977). Carbonized seeds recovered during this test investigation may be intrusive in the archaeological deposit and are thus questionable in their indications of occupational seasonality.

The 1979 mitigation program had the following research objectives: (1) reconstruction of Nebo Hill settlement-subsistence strategies represented at the site, (2) determination of the season of occupation of the site, (3) delineation of stylistic and functional tool types, lithic reduction sequences, and thermal alteration of raw material in the artifact assemblage, and (4) location of sources of lithic raw materials such as chert, sandstone, and quartzite present at the site. Data pertinent to the investigation of these research objectives were obtained by excavation of a large block area in the central portion of the site, mapping of tools, and screening of the soil matrix. Flotation sampling was used to recover micro-floral data. Stylistic and functional tool types were studied by examining edge-wear patterns and measurement of tool categories. Local lithic source areas were visited, and a comparative sample collected.

ENVIRONMENTAL SETTING

The Longview Lake area is located on the upper drainage of the Little Blue River approximately 50 km south of the confluence of the Little Blue and

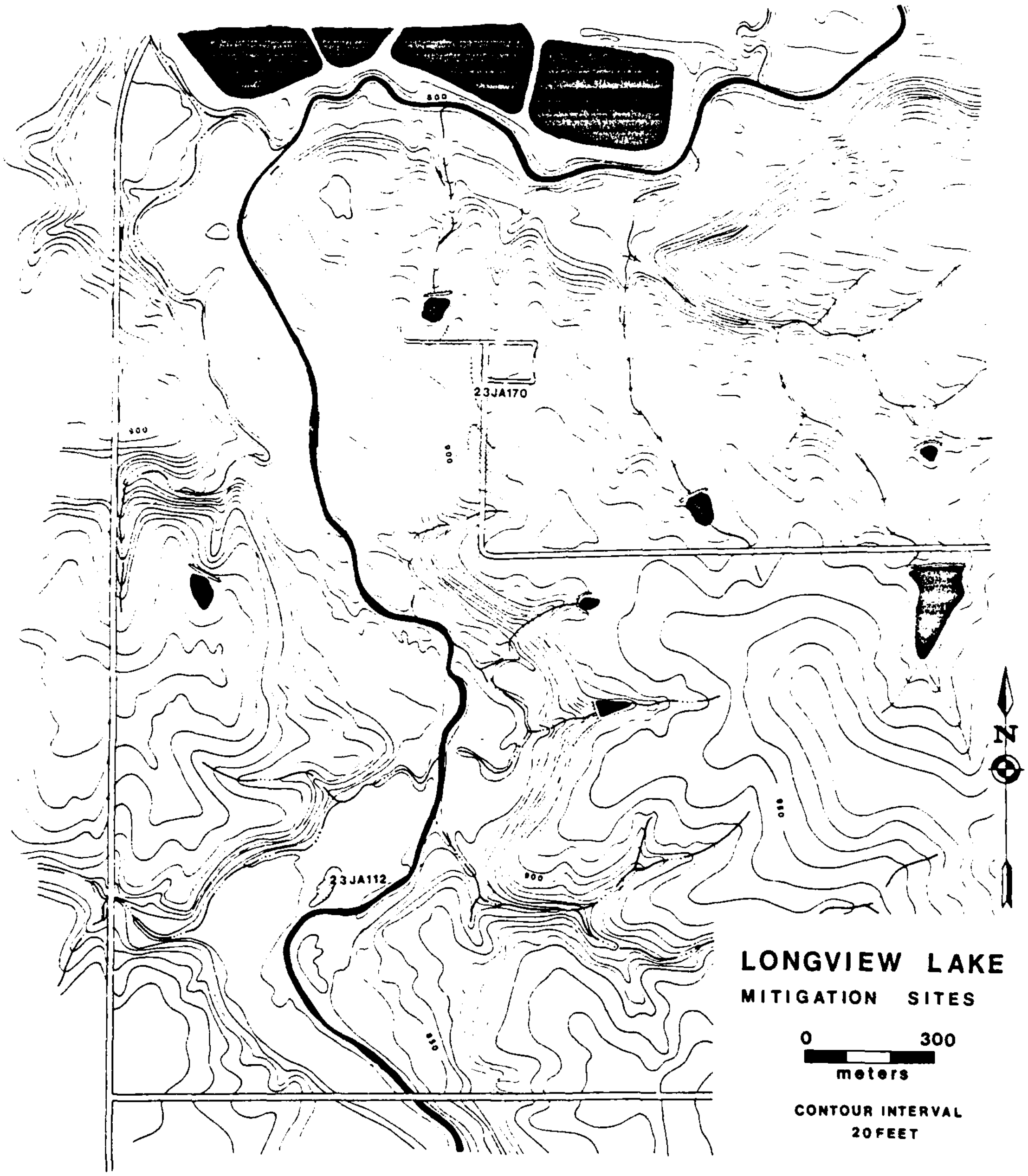

Figure 130. Location of 23JA170.

Missouri Rivers. The local topography is characterized by a steep slope north and west of 23JA170 and broad rolling uplands south and east of the site (Fig. 130). The underlying bedrock at 23JA170 is composed of the Wea shale and Winterset limestone members of the lower Cherryvale and upper Dennis formations. The bedrock is capped by a Pleistocene loess deposit.

The site is located on a Sharpsburg silt loam soil which is moderately well drained and is formed in loess on the upland divide. Soil analysis by the United States Department of Agriculture, Soil Conservation Service indicates that this soil formed under prairie vegetation, although the United States General Land Office Surveys conducted in 1826 indicate that the site area was a slope-upland forest. The 1826 slope-upland forest in this area was composed of dominant black and white oaks with some hickory, linden, and black walnut. The grass and forb dominated upland prairie was located close to the site and may have been more extensive during earlier periods. Common animals in this zone included white-tailed deer, turkey, squirrel, cottontail, raccoon, opossum and bear. Less common animals included bison and wapiti.

In summary, a number of environmental factors characterize the vicinity of 23JA170 site. Food resources are especially abundant in the fall, with acorns becoming available. In addition certain species of animals such as deer, bison, turkey, and squirrels aggregate between upland prairies and the slope-upland forest (McKinley 1969, Schorger 1966). 23JA170 is located on a well drained soil and offered maximal protection from the elements, especially during fall thermal inversions. Thus the favorable microclimate and the availability of local chert and food resources combine to keep the cost/risk/effort subsistence factor low (Jochim 1976). The 23JA170 site location, based on these considerations, was probably selected by the Nebo Hill occupants as a habitation site in order to minimize the distance to the most secure and abundant resources.

DESCRIPTIONS OF THE SITE AND INVESTIGATIONS

23JA170 was first located and tested in 1976 by the University of Kansas for the U.S. Army Corps of Engineers during a cultural resources survey of the proposed Longview Lake (Brown 1977). These test excavations recovered cultural materials to a depth of 50 cm, with the majority concentrated between 10-40 cm below the ground surface. Diagnostic artifacts recovered were indicative of the Late Archaic Nebo Hill Complex and apparently represented a single component occupation. In addition to nine lanceolate Nebo Hill points, two notched points and over 4000 pieces of chipped stone tools and debris were recovered. The 1976 investigations also included a soil phosphate testing program which indicated that the portion of the site containing the highest density of cultural items did not show corresponding high phosphate levels. This pattern of phosphate readings reflects the topography of the site and could be explained by differences inherent in the residual and loessial soils exposed by erosion, or differential erosion of the cultural deposit (Filer and Sorenson, 1977). Based on his investigations, Brown (1977) recommended that a large block excavation be placed adjacent to the 1976 block of test units and that additional test units be placed in areas of high soil phosphate values to determine if cultural features of artifacts were present below the surface.

The data recovery investigations were based on the recommendations of Brown (1977). A large block excavation (48 sq m) was opened adjacent to the 1976 test block. Twenty-two test units were excavated in the designated areas of high soil phosphate content (Fig. 131). The units were excavated by shovel scraping and troweling within 10 cm levels. Diagnostic artifacts and tools were plotted to the nearest cm. All the soil matrix was screened through ¼ inch (6 mm) mesh screen. Flotation samples were taken from each 10 cm level within each one by one m unit. Due to the large amount of soil, the processing of the flotation samples was limited to the block excavation. General views of the excavations at 23JA170 are shown in Figure 132.

Extensive cultural remains were recovered within the block excavation. Naturally occurring tree casts and rodent burrows were noted, but no cultural features were encountered. Cultural debris concentration indices (CI), calculated by dividing the artifact total by the unit volume, indicate that cultural debris varies within the block excavation. Units with more concentrated debris were located in the west and the southeast portions of the block. The CI for the block excavation ranged from 14.5 to 4.2 artifacts per cubic m, with a mean CI of 9.4. The artifact concentration within the test units indicated less concentrated occupation both north and south of the block and on lower slope areas (Fig. 133). The CI for test units ranged from 5.2 to .3 with a mean CI of 1.1. The test unit with the most concentrated cultural debris was located 5 m south of the block. No cultural features were noted in the test units.

Stratigraphy

The surface of the site is composed of soils formed on loess and from the weathering of the Wea shale. Soil development in the loess has occurred in several ways. The Nebo Hill cultural groups which occupied the site probably left a shallow cultural deposit. This cultural deposit became buried due to several factors. Soil organisms and other pedoturbation processes may have contributed to downward movement of the artifacts. Some soil buildup may have occurred due to wind erosion and deposition after natural prairie or forest fires. The most rapid accumulation of this sort probably occurred during the historic period due to plowing and wind erosion, with soil accumulating in fallow fields and along fence rows.

As noted above, the Soil Conservation Service has mapped the soil at 23JA170 as belonging to the Sharpsburg series. This series consists of three silt and clayey silt soil horizons (Fig. 133). The upper stratum is an organically enriched soil plow zone with weak granular structure. This stratum was reported to have been last plowed over 20 years ago and is characterized by rodent burrows and tree casts. Layers of carbonized plants present at the base of this stratum were apparently plowed under and failed to decompose. Uncarbonized seeds and plant remains in this zone may have been deposited through rodent or soil organism activities. The transitional stratum is a silt with a fine to moderate subangular blocky structure and increasing clay content. The lowest stratum is also a clayey silt with a moderate fine subangular blocky structure. As indicated by the illuviated clays in the lower strata, soil development has occurred over a relatively

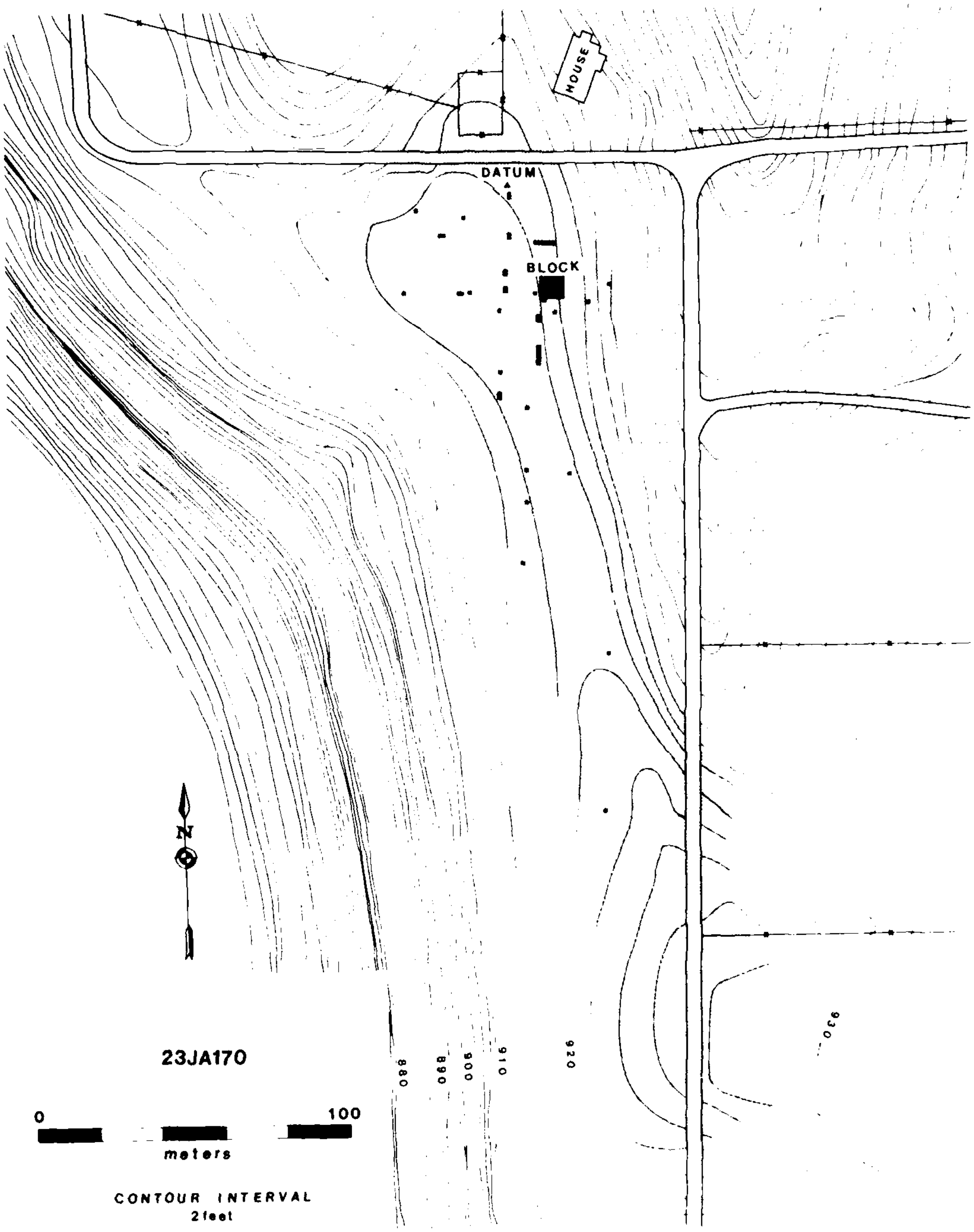

Figure 131. Location of excavation at 23JA170.

Figure 132. General views of the excavations at 23JA170: in progress (upper), completed (lower).

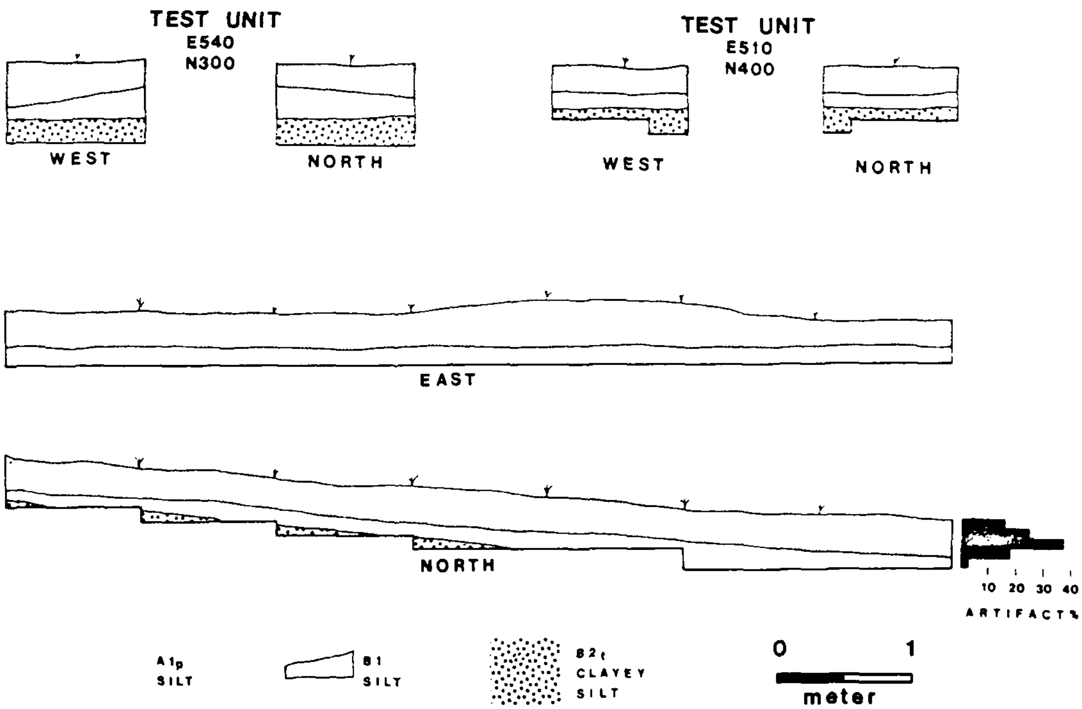

Figure 133. Soil profiles of block excavation and selected test pits at 23JA170.

long period of time. The 0-20 cm level has been disturbed by plowing. Intact cultural deposits and the majority of the recovered cultural remains are present in the 20-30 and 30-40 cm levels.

THE ARTIFACT ASSEMBLAGE

A total of 20,240 artifacts were recovered during the 1979 investigations at 23JA170 and are described in this section. Artifacts include chipped and ground stone tools, lithic manufacturing debris, charcoal, bone, carbonized seeds, and unworked stone. The distribution of artifacts by excavation label is shown in Table 66.

Chipped Stone Tools

The chipped stone tools are made primarily from local tan Winterset, Argentine, blue-gray Winterset, and Westerville chert. In addition to these cherts, unidentified chert types, probably derived from Mississippian geologic strata in central Missouri, are present in small quantities.

Bifacial Tools

This group of artifacts includes tools and possible tool preforms that have been manufactured by percussion and pressure flaking on both faces. These tools include projectile points and point fragments, large oval and lanceolate bifaces used as cutting and scraping implements and bifacial drills.

Projectile Points (n=38)
A total of 38 projectile points and point fragments were recovered from 23JA170 (Fig. 134a-l). Thirty-seven points are lanceolate forms, and one is a side-notched fragment with a broad triangular blade. Twenty-one bases, six midsections, and eleven tips are represented in this category. Twelve are made of Westerville chert, one of a chert type resembling Spring Hill, nine of unidentified brown, gray, white and banded cherts probably derived from the Mississippian strata of central Missouri, eight of tan Winterset, seven of blue Winterset chert, and one of Argentine. Reddened areas, interpreted as heat discoloration, are present on 57 percent of these tools. Cortex surfaces remain on five specimens.

Table 67 presents statistical data for basic size dimensions of the lanceolate projectile point assemblage. Width and thickness are the most uniform variables. These dimensions may have been of prime importance in the use of lanceolate points. Variability in the distal arc (point tip) and evidence of resharpening suggests that the length of the point was not important to the function of the point as a penetrating missile.

Based on the incidence of resharpening of broken points and the range of variability of point outlines, the 23JA170 point assemblage represents the latter stages of a projectile point reutilization trajectory.

Table 66. Artifact assemblage recovered from 23JA170.

	BLOCK EXCAVATION					TEST UNITS					TOTAL
	0 – 10	10 – 20	20 – 30	30 – 40	40 – 50	0 – 20	20 – 30	30 – 40	40 – 50	50 – 60	
CHIPPED STONE TOOLS											
Projectile Points	7	7	16	6				1			38
Bifacial Knives			2	11	1	1	1				15
Biface Fragments		2									2
Drills	1	2	2	1							6
Hammer Stones			2								2
Retouched Flakes	14	28	18	4	1	6	1				72
Edge-Modified Flakes	57	99	121	53	13	12	3	2			360
Total	79	138	161	75	15	19	5	3			495
MANUFACTURING DEBRIS											
Cores	3	10	9	10		6	1				39
Flakes	1080	1777	2536	1200	96	77	85	28	10	3	6892
Chunks	754	1240	1769	837	67	53	58	19	7	1	4805
Shatter	678	1116	1596	753	61	47	52	17	8		4328
Total	2515	4143	5910	2800	224	183	196	64	25	4	16064
GROUND STONE TOOLS											
Mano				1							1
Metates			2			1					3
Abraders	1		1	1							3
Total	1		3	2		1					7
MINERALS											
Hematite	10	30	45	47	1	3	2	1			139
Limonite	1	2	3	3							9
Total	11	32	48	50	1	3	2	1			148

(continued)

Table 66. Artifact assemblage recovered from 23JA170.

	BLOCK EXCAVATION					TEST UNITS					TOTAL
	0 - 10	10 - 20	20 - 30	30 - 40	40 - 50	0 - 20	20 - 30	30 - 40	40 - 50	50 - 60	
UNWORKED STONE	411	973	1290	517	41	115	41	20	16	12	3436
ORGANIC REMAINS											
Charcoal		5	6	14	1						26
Bone	6	7	1								14
Shell	10										10
Seeds			1	1							2
Total	16	12	8	15	1						52
MODERN MATERIAL											
Coal	16	7	4	6	3						36
Metate	2										2
Total	18	7	4	6	3						38
TOTAL	3051	5305	7424	3465	285	321	244	88	41	16	20240

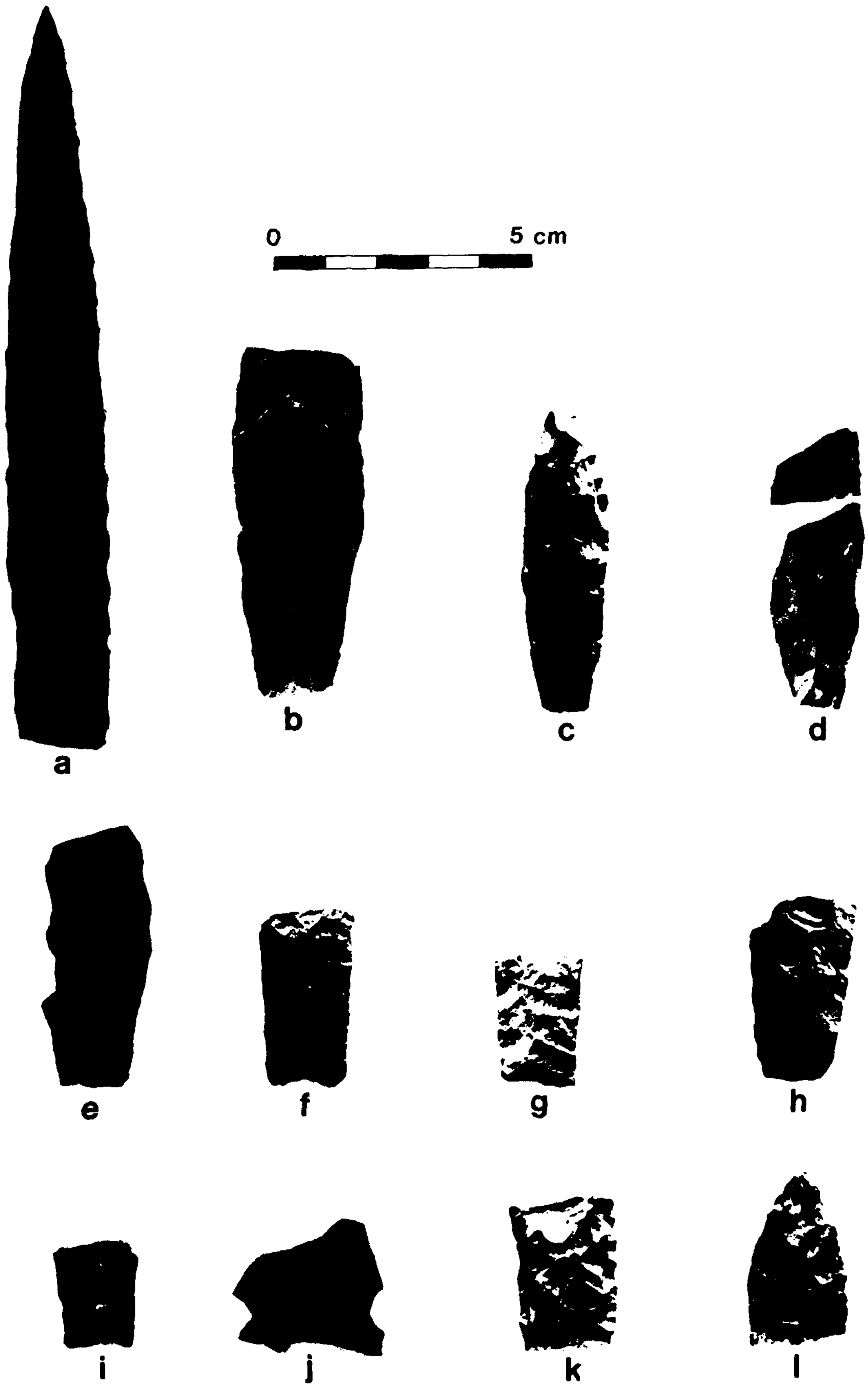

Figure 134. Projectile points from 23JA170.

Table 67. Descriptive data for projectile points from 23JA170.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	EDGE SHAPE**	EDGE WEAR***	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Width	Thickness	DEGREE DISTAL ARC
517	E515N470	22	AR	B/P	2A	+	24.2	-	1.9	1.2	20
1120	E516N471	29	WV	BC	2A	+	7.0	5.9	1.7	.8	34
1538	E512N468	26	WV	BC			2.4	-	1.7	.8	-
1211	E512N470	23	UNID	BC		+	2.0	-	1.7	.8	-
1210	E512N470	29	TWS	BC			3.3	-	1.7	.7	-
1326	E513N466	31	WS	BC			1.2	-	1.5	.8	-
803	E513N468	17	WV				.8	-	1.5	-	-
1068	E513N471	23	UNID	BC			2.2	-	1.9	.8	-
885	E514N467	28	WV	PC	2BG	+	4.5	-	1.9	.7	-
36	E516N467	0-20	UNID	B/P		+	9.7	-	1.9	1.1	22
11	E518N466	23	WV	BC	1A	+	5.6	-	2.0	.8	-
740	E518N467	0-10	WV	BC			1.9	-	1.9	-	-
754	E518N467	19	WS	BP	3BG		5.3	-	2.2	.8	-
166	E519N468	29	UNID	BC		+	10.0	-	-	.9	-
1653	E513N465	16	UNID	BC	2A		6.5	-	1.9	1.0	36
1660	E513N465	29	WV	BC		+	4.9	-	2.3	1.2	-
853	E514N468	27	UNID	BC			1.7	-	1.7	.7	-
1887	E516N466	29	TWS	PC	1A		6.7	-	2.0	.9	-
756	E518N467	12	TWS	BP	1A	+	4.9	-	2.2	1.0	-
1031	E515N471	24	UNID			+	4.3	-	2.9	-	-
1630	E512N466	31	WV	B/P	2A,S	+	14.5	-	3.0	1.3	26
1111	E516N471	20	AR	BP	2A,S	+	15.2	-	2.6	1.5	18
16	E518N466	30-40	TWS	PC		+	7.4	-	2.5	1.2	-
21	E518N466	31	WS	BC	1A,S		19.4		2.7	1.6	-
123	E519N469	9	WS	BC	2A,S	+	10.4	-	2.6	1.1	-
1615	E512N466	28	TWS	BC	1A		2.2		-	.7	-
1459	E512N467	0-10	WS	WS			.2	-	-	-	-

(continued)

Table 67 Continued. Descriptive data for projectile points from 23JA170.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	EDGE SHAPE**	EDGE WEAR***	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Width	Thickness	DEGREE DISTAL ARC
1186	E512N470	5	TWS	BC	2A,S	+	5.6	-	-	1.0	16
785	E513N468	9	UNID				1.2	-	-	.7	-
1896	E515N466	0-10	WV	PC			.2	-	-	.3	14
216	E517N469	13	WS		1A,S		2.0	-	-	1.2	-
753	E518N467	18	UNID	BC			1.7	-	1.3	.6	18
755	E518N467	20	TWS	BC	1A,S	+	2.6	-	-	1.1	-
776	E518N467	30-40	WV				.5	-	-	.7	-
1715	E517N460	20-30	TWS	BC			1.2	-	-	.7	-
1716	E517N460	20-30	WV	BC	2A		20.4	-	2.5	1.1	-
1704	E524N410	30-40	UNID	BC			2.6	-	1.8	.7	-
1816	E539N350	21	WS	PC	2A,S	+	8.4	-	2.3	1.2	-

*Material type: (WS) Blue Winterset, (AR) Argentine, (WV) Westerville, (UNID) Unidentified, (TWS) Tan Winterset

**Edge shape: (BC) Biclinal, (PC) Planoclinal, (B/P) Biclinal/planoclina.

*** Edge wear: (A) Attrition, (S) Step flake, (BG) Basal grinding.

The bases of these lanceolate points range from straight to slightly concave. The stem widths and the length of the broken stems are remarkably consistent, indicating that these points were hafted in the same manner and to the same depth, probably by insertion into a socketed foreshaft.

Lipped transverse breaks were noted on the points. These breaks occurred at two locations near the stem at the probable depth of insertion into the haft and near the tip or distal portion of the blade.

One side-notched point was recovered during the 1979 investigations. Only a fragment of the haft was present. This point was made of an unidentified brown banded chert and exhibits heat discoloration.

The lanceolate projectile points resemble the Nebo Hill point type as described by Shippee (1964). This point type is most common in the Northwest Prairie Region of Missouri, but is also found in the Northeast Prairie Region (Chapman 1975), and has been radiocarbon dated between 1605±65 B.C. (Reid 1975) and 1020±490 B.C. (Reeder 1978). The occurrence of side-notched points in other Nebo Hill contexts suggest that this point form comprises a minor part of the Nebo Hill assemblage (Reid 1978, Reeder 1978). Based on comparisons with hafted specimens from dry rock shelters, this side-notched point was probably hafted into a split foreshaft (Harrington 1960, Shippee 1966). This point resembles the Big Sandy point type (Chapman 1975:242).

Bifacial Knives (n=15)

Fifteen tools with oval to lanceolate outlines and thick cross-sections exhibit wear which indicates use as knives (Fig. 135a-g). Due to their large size and lack of haft indications, they may have been hand held during use. Descriptive data for bifacial knives is presented in Table 68.

This is a relatively homogeneous morphological category as indicated by the length, width, and thickness measurements.

Seven bifacial knives exhibit biclinal working edges. Eight tools exhibit a planoclinal working edge in addition to a biclinal edge. Biclinal working edges, in combination with obliquely oriented use flake scars are generally associated with use as cutting tools, while planoclinal working edges with step flakes are generally associated with scraping (Reid 1978:78, Lawrence 1979). These tools probably functioned as generalized cutting and scraping implements. The relatively large size of these tools would aid in heavy duty butchering and wood modification activities.

Sixty-seven percent of the tools are made of local tan Winterset chert. Heat discoloration is exhibited on 40 percent of these specimens. Four tools are made of blue Winterset chert. One tool is made of weathered Argentine chert. Cortex surfaces remain on 11 specimens.

Biface Fragments (n=4)

This residual category consists of small biface fragments. The thickness and remnant edges indicate possible use as projectile points or thin knives. These fragments are tan Winterset chert, and exhibit heat discoloration.

Figure 135. Bifacial knives from 23JA170.

Table 68. Descriptive data for bifacial knives at 23JA170.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	EDGE SHAPE**	EDGE WEAR***	HEAT DIS-COLORATION	WEIGHT (g)	DEMENSIONS (cm) Length	Width	Thickness
114	E515N467	31	TWS	BC	2R,S		81.2	7.8	7.2	2.1
278	E518N469	33	TWS	PC,BC	2R,S	+	79.5	8.5	4.9	2.2
1325	E513N466	31	TWS	BC	4R,S	+	40.0	7.5	4.0	1.5
1324	E513N466	38	TWS	BC,PC	2R,S;1P	+	46.6	8.7	3.8	1.7
523	E515N470	30	AR	PC,BC	2R,A		9.1	-	3.1	.7
113	E515N467	44	TWS	BC	2R,A;1S		22.0	-	3.4	1.7
1126	E516N471	31	TWS	BC	2R,S,A		61.2	-	5.2	2.0
658	E518N470	33	TWS	PC,BC	2R,S;1R	+	22.8	-	3.5	1.2
138	E519N469	21	TWS	PC,BC	2R,S,A		44.4	-	4.1	1.7
1430	E512N465	35	TWS	BC	2R,S,A		48.4	-	4.0	1.9
1808	E539N350	0-20	BWS	BC	2R,S		27.3	-	3.3	2.0
190	E517N467	35	BWS	BC	3R		25.5	-	3.2	2.3
1628	E512N466	31	TWS	PC,BC	3A,S	+	27.5	5.4	5.9	1.5
1672	E513N465	33	BWS	PC,BC	3R,S		27.4	6.5	3.5	1.8
1286	E513N466	20	BWS	PC,BC	1R,S,A		10.5	3.3	1.9	1.9

*Material type: (AR) Argentine, (TWS) Tan Winterset, (BWS) Blue Winterset
**Edge shape: (BC) Biclinal, (PC) Planoclinal
*** Edge wear: (R) Retouch, (A) Attrition, (S) Step flake, (P) Projection

Drills (n=6)

Six tools exhibit use wear on alternate faces of their lateral margins indicative of use as drills (Fig. 136a-e). Two tools have ground rectangular bases. One drill was made by reworking the tip of a triangular biface, and two were made by bifacially retouching pointed flakes. These tools were probably used for heavy duty drilling of wood, bone, or stone materials.

Thickness is the most uniform variable. The differing distal arc measurements may indicate use on different types of materials or represent a use reduction trajectory. All these tools were probably hafted.

Three drills were made of blue Winterset and three of tan Winterset cherts. Four exhibit heat discoloration. Cortex surfaces remain on two specimens.

Unifacial Tools

This group of artifacts consists of edge-modified flakes. One category has been retouched along one or more lateral edges and exhibits distinctive wear patterns indicative of use. Tools within this category are characterized by relatively steep working edge angles.

These tools consist of flakes which exhibit minor attrition or damage along one or more lateral edges. Tools within this category are characterized by relatively thin working edge angles, and do not exhibit distinctive wear patterns.

Marginally Retouched Tools (n=73)

Seventy-three flakes exhibit edge modifications which can be assigned specific functions. Flakes included as marginally retouched showed a continuous series of retouch along at least 1/3 of a flake margin, with original flake shape not significantly altered. The use-wear criteria used in this study follow those outlined by Lawrence (1979). Inferred functions include scraping, drilling, engraving, and cutting of wood, bone, or other materials. These types of work were light duty compared to the types of work indicated by the bifacial tool assemblage. Various combinations of these wear types are found on individual flake tools. Scraping wear is exhibited on 77 percent, engraving wear on 60 percent, cutting wear on 20 percent, and drilling wear on eight percent of these flake tools. Working edges are predominantly straight to convex, with only 25 percent of the tools having concave edges.

Tan Winterset chert comprises 64 percent, and blue Winterset 33 percent of the flake tool raw material. Two tools are made of Westerville, and one of an unidentified white chert. One Argentine tool was recovered. Heat discoloration is exhibited on 56 percent of the specimens. Cortex surfaces remain on 63 percent of the flake tools.

Edge-Modified Flakes (n=360)

A total of 360 edge-modified flakes were recovered in 1979 at 23JA170. The majority of these flakes exhibit attrition along straight to convex edges, while 16 percent exhibit attrition along concave edges. Statistical data for this assemblage are presented in Table 69. Based on a comparison of the statistics of the flake tool and edge-modified flake tool assemblages, edge-

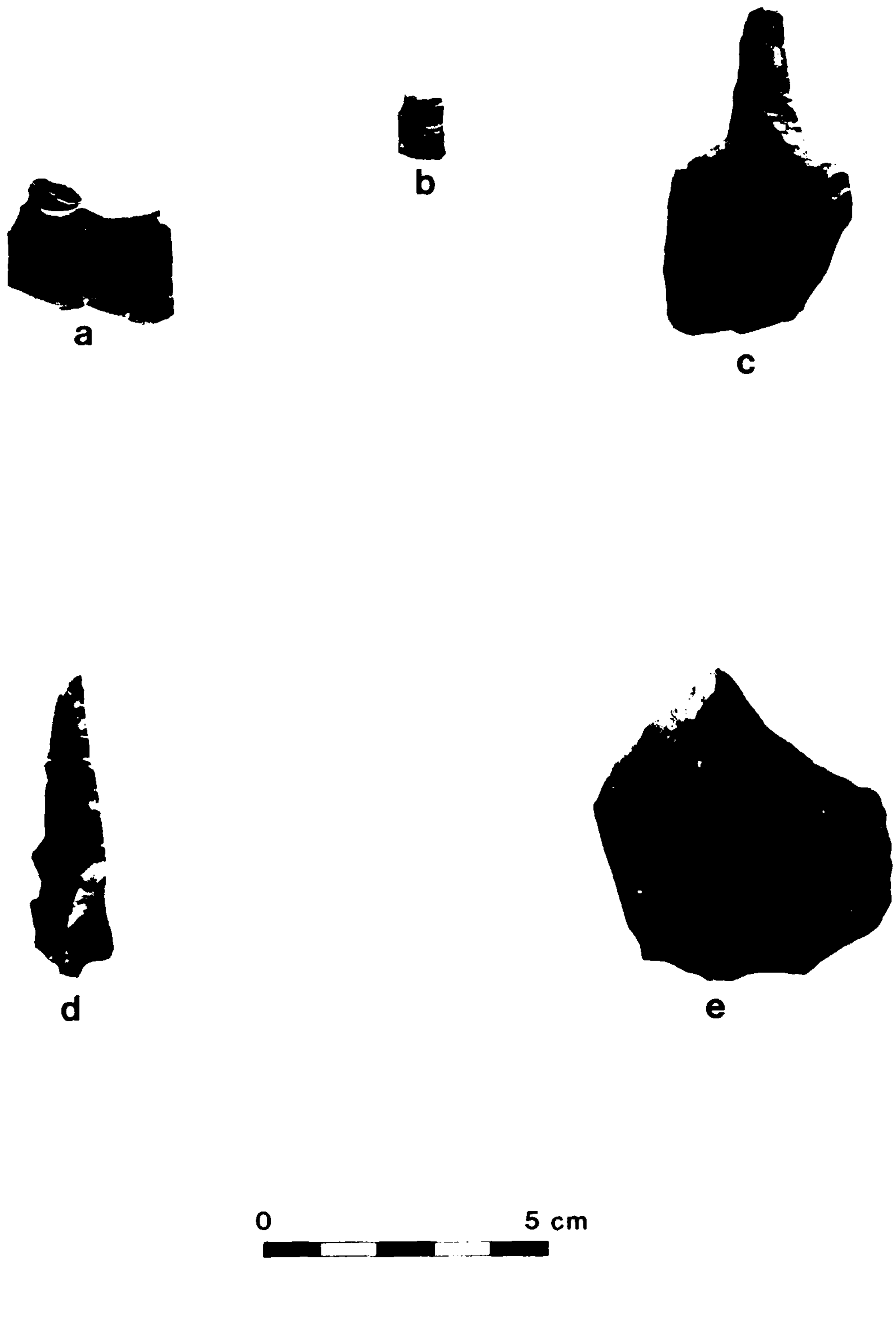

Figure 136. Drills from 23JA170.

Table 69. Descriptive data for edge-modified flakes at 23JA170.
Page 1.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
1796	E467N463	0-20	TWS	1	1S, 1P		+	6.7	3.6	3.1	.7
1748	E470N490	0-20	WS		2A, 1P			5.3	2.2	3.8	.8
63	E499N459	0-15	TWS	1	1A, 1P		+	2.6	2.5	1.9	1.3
68	E499N459	15-25	WS			1A	+	1.0	1.4	2.1	.4
70	E499N459	15-25	TWS		1A		+	1.3	2.5	1.6	.4
1775	E510N410	0-20	TWS	2	1A		+	1.8	2.4	2.0	.4
289	E510N465	11-21	TWS	1WX	1A			5.2	4.0	2.7	.7
290	E510N465	11-21	TWS		2A, 1P		+	6.3	2.0	3.0	1.5
293	E510N465	11-21	TWS	1WX	1A, S			3.7	2.3	2.8	.8
1184-1	E512N470	0-10	TWS	1WX	2A, R		+	21.7	3.8	5.9	1.2
1184-2	E512N470	0-10	TWS	1	2A		+	1.2	1.9	1.5	.7
1185-1	E512N470	0-10	WS	1	1S			1.3	1.5	1.9	.5
1185-2	E512N470	0-10	WS		2A		+	2.2	2.8	1.5	.5
1188	E512N470	8	TWS		1A, S	1S		3.3	3.8	2.2	.4
1194	E512N470	10-20	TWS		1A			3.4	3.7	2.1	.6
1195	E512N470	10-20	WS		2A			1.0	1.9	1.5	.3
1201	E512N470	17	TWS		1A		+	3.4	3.5	1.8	1.0
1397	E512N465	0-10	TWS	1WX	1A			1.0	1.2	1.5	.5
1403	E512N465	10-20	TWS	2	1A, 1P		+	.8	1.2	1.2	.4
1404	E512N465	17	AR	2	2A		+	9.4	3.6	3.1	.9
1406	E512N465	15	WS		1A		+	1.2	1.5	2.1	.4
1458	E512N467	0-10	TWS		1A, 2S, 1P		+	3.7	2.6	3.1	.6
1461	E512N467	0-10	WS	1	2A			2.3	2.1	2.2	.5
1462	E512N467	0-10	TWS	1WX	1A			2.9	3.7	2.7	.5
1463	E512N467	9	TWS	1	1A, 1P		+	2.8	3.0	2.6	.5
1471	E512N467	10-20	WS		1A	2S		2.3	2.3	2.4	.4
1509	E512N468	10	WV	2	1A, R			10.9	5.2	3.5	.9

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
Page 2.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
1510	E512N468	10	WS		1A			1.0	2.1	1.2	.4
1517	E512N468	10-20	TWS	1	1A		+	1.1	1.3	2.3	.4
1518-2	E512N468	10-20	TWS		1A			1.3	2.0	1.8	.4
1518-1	E512N468	10-20	WS	1	1A			1.0	1.4	2.2	.5
1519	E512N468	10-20	AR		1A			1.8	2.2	1.4	.5
1520	E512N468	10-20	TWS	1WX	1A, 1P		+	4.4	3.4	1.9	1.0
1522	E512N468	17	TWS	1	1A	1A		1.1	2.1	1.7	.3
1526	E512N468	12	WS		1A		+	2.5	2.5	2.8	.3
1558	E512N469	10-20	WS	1WX	1A			2.0	2.0	2.6	.4
1559	E512N469	10-20	AR	1	1A, 1P		+	13.4	3.9	3.3	1.4
1585	E512N466	0-10	TWS		1A		+	.8	1.8	1.3	.3
1596	E512N466	10-20	WS		2A			2.6	2.6	3.3	.4
1597	E512N466	10-20	TWS	1	2A		+	4.3	3.2	2.8	.7
1598	E512N466	10-20	TWS	2	1A			3.2	3.5	2.1	.5
1599	E512N466	15	WS	1	2A, 1P		+.	3.2	2.5	2.8	.6
1884	E512N466	0-10	TWS		2A		+	1.7	1.9	2.5	.4
670	E513N469	10-20	TWS	1	2A, S, 1P			1.1	1.4	1.8	.3
671	E512N469	15	TWS	2	1A, S		+	1.5	1.1	2.2	.6
672	E513N469	19	WS		1A, S			1.3	1.6	1.6	.4
783	E513N468	0-10	TWS	1	1A			3.1	2.5	2.3	.5
784	E513N468	0-10	WS		1A		+	1.2	1.9	1.6	.3
793	E513N468	10-20	TWS		1A		+	1.0	1.8	1.2	.4
796	E512N468	10-20	TWS		2A		+	1.0	2.5	1.3	.3
802	E513N468	15	TWS		1A			1.0	2.8	1.3	.2
804	E513N468	10-20	WS	1	1A			1.5	1.5	1.9	.5
953	E513N470	0-10	WS	2	1A, R			3.8	2.8	2.6	.7
954	E513N470	0-10	TWS	1	1A, R			2.3	3.1	1.9	.4
960	E513N470	5	WS			1A, S		.8	1.6	1.2	.2

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
Page 3.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
971	E513N470	10-20	WS		1A			1.3	1.2	1.7	.5
972	E513N470	11	TWS	1WX	1A			6.2	3.7	2.6	1.0
1042	E513N471	0-10	WS	1WX	1A, S			2.4	2.1	2.1	.6
1050	E513N471	10-20	WS	1	1A, P		+	2.2	1.9	1.9	.6
1053	E513N471	10-20	AR		1A		+	3.0	3.2	3.0	.6
1054-1	E513N471	10-10	TWS		2A, P		+	2.6	2.3	2.5	.4
1054-2	E513N471	10-20	TWS		1A		+	1.0	2.6	.7	.4
1055-1	E513N471	10-20	TWS	1	2A		+	4.6	3.4	3.1	1.0
1055-2	E513N471	10-20	TWS		1A, 1P		+	3.0	3.2	1.3	.8
1275	E513N466	6	WS	1	1A, 1P	1A		10.0	4.4	3.8	.7
1274	E513N466	13	AR		1A, 1P		+	1.9	1.6	2.3	.5
1285	E513N466	13	TWS		1A		+	17.3	4.7	2.5	1.8
1290	E513N466	13	TWS		1A		+	1.3	1.6	2.3	.3
1298	E513N466	13	TWS		1A		+	2.6	2.0	2.4	.5
1642	E513N465	0-10	TWS	1	1A, S		+	4.3	2.9	1.9	.6
1649	E513N465	10-20	TWS		1A		+	2.3	2.2	2.1	.4
1857	E513N464	17	WS		1A			6.7	2.3	1.7	.9
463	E514N469	10-20	WS		1A		+	.8	.9	1.9	.4
465	E514N469	10-20	TWS	1	1A	1A		1.8	2.3	1.7	.4
832	E514N468	0-10	WV		1A		+	3.5	2.6	3.1	.5
833	E514N468	0-10	WS		1A			1.4	1.9	2.2	.3
834	E514N468	0-10	TWS		1A			1.4	1.7	2.0	.4
839	E514N468	10-20	TWS		1A		+	4.0	2.8	2.2	.5
842	E514N468	15	TWS	3	1A			2.7	2.5	1.8	.7
873	E514N467	10-20	WS	1	2A			3.5	4.1	1.6	.7
875	E514N467	11	TWS	1WX	1A			2.9	1.9	2.5	.7
877	E514N467	17	WS	1WX	2A		+	2.3	2.6	2.1	.5

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
878	E514N467	17	TWS	1	1A		+	3.2	3.3	2.0	.5
1130	E513N471	0-10	WV		1A		+	2.7	2.9	2.3	.4
1135	E514N471	10-20	WS	1WX	1A			3.4	2.3	2.6	.5
1137	E514N471	10-20	WS	1WX	1A			2.3	1.4	2.5	.7
1138	E514N471	19	AR		1A		+	2.3	2.0	2.5	.4
1898	E515N466	12	WV	1WX	1A, 1P		+	8.8	3.4	3.2	.7
83	E515N467	0-10	TWS		1A		+	1.6	1.7	1.8	.5
90	E515N467	14	TWS			1A	+	3.3	2.9	1.9	.5
408	E515N469	10-20	TWS		1A		+	1.4	1.5	2.1	.5
409	E515N469	11	TWS		1A		+	5.5	4.3	1.5	1.4
424	E515N468	7	TWS		1A, 1P		+	3.3	3.0	1.5	.8
434	E515N468	19	WS	1	1A		+	2.1	1.5	1.9	.5
436	E515N468	19	TWS		1A		+	1.3	2.5	2.3	.3
492	E515N470	0-10	TWS	1	1A			1.7	2.2	2.1	.3
494	E515N470	0-10	WS		1A		+	11.9	3.0	3.2	1.0
502	E515N470	10-20	TWS		1A			1.3	2.4	1.9	.3
503	E515N470	10-20	AR		1A		+	1.0	2.5	1.3	.3
1019	E515N471	0-10	WS			1A		5.1	3.0	3.0	.8
33	E516N467	0-20	TWS	1	1A		+	4.7	2.6	3.2	.8
34	E516N467	0-20	WS		1A		+	10.7	4.4	3.5	.7
319	E516N469	10-20	TWS	1	1A		+	1.7	2.4	2.4	.3
320	E516N469	10-20	AR	2	1A		+	3.8	3.1	1.5	.9
345	E516N468	0-10	TWS		A, 1P		+	1.4	2.0	1.5	.7
346	E516N468	0-10	WS	2	1A			1.6	1.6	2.2	.5
347	E16N468	0-10	TWS	2	2A		+	3.7	3.0	2.3	.6
348	E516N468	9	TWS		2A		+	6.4	3.6	3.0	.7
356	E516N468	13	TWS	1	1A		+	5.6	3.5	2.3	.8

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
359	E516N468	11	TWS		1A		+	2.0	2.9	1.4	.5
618	E516N470	10-20	WS	2	2A		+	3.5	3.3	1.7	.8
179	E517N467	15	TWS		1A		+	3.5	3.6	2.3	.7
184	E517N467	10-20	TWS	1WX	1A	1A	+	5.1	4.2	2.8	.6
206	E517N469	9	WS		1A, 1S			1.3	1.5	2.0	.4
208	E517N469	8	TWS		2A	1A	+	6.3	4.7	2.3	.7
217	E517N469	16	TWS		1A		+	.8	1.5	1.6	.2
699	E517N468	0-10	TWS		1A		+	2.2	2.7	1.7	.5
708	E517N468	10-20	WS		2A			1.9	1.9	1.9	.4
1005	E517N471	0-20	TWS	3	2A, 1P			15.5	5.4	3.1	1.4
1007	E517N471	12	WS	1	2A			1.0	2.4	1.4	.5
1083	E517N470	0-10	WS	1	1A		+	.9	2.0	1.4	.4
1089-1	E517N470	10-20	WS	1	1A	1A		1.0	2.2	1.1	.5
1089-2	E517N470	10-20	WS		1A			.6	1.2	1.2	.2
1089-3	E517N470	10-20	WS		1A, 1P			1.7	2.3	1.9	.4
1089-4	E517N470	10-20	WS		1A			1.2	2.3	1.1	.3
1090	E517N470	10-20	TWS		1A			4.7	2.3	3.2	.5
1091	E517N470	10-20	TWS	1WX	1A, 1P		+	1.7	2.0	1.8	.5
1092	E517N470	17	WS	2	2A		+	11.3	3.4	3.6	.9
1093	E517N470	16	TWS		1A		+	7.1	5.2	2.6	.5
1094	E517N470	17	TWS		1A			1.6	2.4	1.3	.5
240	E518N468	10-20	TWS		2A		+	1.1	1.8	2.1	.3
242-1	E518N468	10-20	WS		1A, 2P		+	3.1	2.2	2.9	.8
242-2	E518N468	10-20	TWS		1A		+	2.1	3.3	2.2	.4
265	E518N469	10-20	TWS	1WX	1A, 1P		+	2.5	3.1	1.8	.5
267	E518N469	10-20	TWS		2A, 1P		+	4.8	4.2	1.9	.6
268	E518N469	10-20	TWS	1	1A			4.4	3.1	2.9	.6

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Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	WEAR AND EDGE SHAPE*** Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	DIMENSIONS (cm) Depth	DIMENSIONS (cm) Thick-ness
636	E518N470	0-10	TWS	1	1A	1A	+	2.4	3.6	1.9	.4
637	E518N470	9	WS	1	1A	1A	+	3.6	4.3	1.8	.5
642	E518N470	15	WS	1	1A, R, 1P			4.9	3.6	2.2	.8
741	E518N467	0-10	TWS	1	1A, P		+	6.8	2.9	2.9	.8
742-1	E518N467	0-10	WS		1A			2.2	2.3	2.0	.7
742-2	E518N467	0-10	WS	1	1A			3.5	2.2	2.7	.8
744	E518N467	10	TWS	1	1A, 1P		+	8.3	4.2	2.8	1.2
750	E518N467	10-20	TWS	1	1A		+	4.2	3.4	2.0	.7
751	E518N467	10-20	WS	1	1A			1.7	2.1	1.5	.5
757	E518N467	13	WS		1A		+	3.8	3.0	1.5	.7
758	E518N467	17	WS		2A			5.3	3.5	2.4	.7
759	E518N467	12	WS		1A, 1S, 1R			6.5	3.5	3.6	.6
934	E518N471	0-10	TWS	2		2A	+	11.1	4.2	3.7	1.1
935	E518B471	0-10	WS		1A			1.0	1.9	2.0	.3
941	E518N471	0-20	TWS		2A		+	2.7	3.1	2.2	.5
121	E519N469	0-10	TWS		3A		+	2.3	4.3	1.3	.5
122	E519N469	0-10	TWS		1A, S	1A	+	2.1	3.1	1.8	.5
130	E519N469	14	TWS		1A, P		+	2.1	2.1	1.8	.5
553	E519N467	0-10	TWS		1A		+	2.9	2.5	2.3	.8
558	E519N467	19	TWS		1A		+	1.7	2.5	2.3	.4
913	E519N471	0-10	TWS	2	1A, P			1.9	1.8	2.2	.6
914	E519N471	10-20	TWS	WX	2A		+	4.5	2.0	3.3	.7
921	E519N471	10-20	WS	1		1A		7.7	4.1	2.7	1.0
922	E519N471	17	TWS	1	1A, 1P			18.5	3.7	3.9	1.5
1691	E524N410	0-20	WS	1	1A			2.5	3.2	2.2	.5
1694	E524N410	0-20	TWS		1A			2.5	2.9	1.6	.5
1697	E524N410	9	TWS	2	1A		+	7.6	4.4	2.0	1.0

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Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
1733	E527N463	0-20	WS	1	1A			2.2	2.3	2.1	.5
1734	E527N463	0-20	TWS	3	1A			3.0	2.5	2.4	.6
1785	E540N300	0-20	TWS		1A			1.7	1.7	1.6	.6
1231	E513N467	10-20	WS	1	[illegible]		+	23.0	2.3	3.5	.4
956	E513N470	5			1A, [illegible]		+	3.2	3.9	5.7	2.0
178	E517N467	0-20	TWS		1A, [illegible]		+	1.5	2.1	1.5	.5
153	E519N469	31	WS	1	1A			8.7	4.3	4.7	.8
1156	E519N470	0-10	WS	1	1A		+	1.4	1.3	2.3	.4
1172	E519N470	20-30	WS	2	1A		+	2.7	2.7	2.2	.5
302	E510N465	29-39	WS	1	1A		+	3.0	2.9	2.3	.7
303	E510N465	29-39	TWS		1A			1.1	2.9	1.5	.3
1836	E512N464	25	WS	1	1A, 1P		+	2.7	2.6	1.8	.5
1837	E512N464	25	TWS	1	1A		+	6.7	2.8	3.0	1.0
1838	E512N464	25	TWS	1, 1WX	1A, 1P		+	3.0	6.3	3.2	1.8
1413	E512N465	20-30	WS		1A	1A		.4	1.6	1.2	.3
1418	E512N465	30	WS		1A		+	4.6	2.4	2.6	.7
1420	E512N465	24	WS		2A, 1P		+	10.2	4.3	3.9	.8
1480	E512N467	20-30	TWS		2A		+	2.0	2.0	2.6	.4
1489	E512N467	29	TWS	1, 1WX	1A, 1A, S			15.8	5.6	2.8	1.3
1600	E512N466	20	WS	1	2A			3.8	4.4	2.2	.5
1606	E512N466	20-30	WS		1A, S			9.8	2.4	2.4	1.8
1609	E512N466	25	WS	2	1A		+	1.5	2.1	2.1	.5
1611	E512N466	24	WS	1		1A, S	+	11.3	4.5	4.0	.8
1614	E512N466	29	TWS	1WX	3A		+	8.8	4.5	2.8	1.0
1523	E512N468	20	TWS	1	1A		+	3.3	2.9	2.7	.6
1533	E512N468	27	AR	1	1A			2.3	2.6	3.0	.4
1535	E512N468	24	WS	1		1A	+	8.2	4.3	2.5	1.0

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Table 69. Descriptive data for edge-modified flakes at 23JA170. Page 8.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	WEAR AND EDGE SHAPE*** Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	DIMENSIONS (cm) Depth	DIMENSIONS (cm) Thickness
1536	E512N468	23	TWS		1A, S	1A	+	.7	2.0	1.7	.3
1539	E512N468	25	WS	2	1A			4.5	3.0	3.0	.7
1540	E512N468	28	TWS	1	1A		+	3.5	2.3	3.1	.9
1541	E512N468	29	WS	1		1A		16.7	4.9	4.7	1.2
1549	E512N468	33	TWS		1A, P			2.2	3.1	1.4	.6
1565	E512N469	20-30	WS		2A, 2P			2.1	3.2	2.0	.4
1567	E512N469	20-30	WS	1	1A	1A		4.3	2.8	2.3	.7
1209-2	E512N470	20-30	TWS		2A	1A		5.0	4.2	1.9	.6
1209-4	E512N470	20-30	TWS	1	1A	1P		1.4	2.6	1.6	.4
1209-1	E512N470	20-30	TWS		1A, 2P			2.7	2.3	2.6	1.0
1209-3	E512N470	20-30	TWS	1	1A, P			1.3	2.3	1.6	.6
1378	E512N471	23	TWS	1	1A			3.1	3.1	2.7	.5
1379	E512N471	24	WS		1A			1.6	1.9	2.4	.6
1841	E512N464	30-40	TWS		1A			.7	1.9	2.0	.2
1842	E512N464	30-40	TWS	1	1A		+	1.4	2.2	2.2	.5
1843	E512N464	30-40	WS		1A			3.0	3.3	3.7	.8
1844	E512N464	30-40	WS		1A			1.2	3.1	1.2	.4
1431	E512N465	34	AR	1WX	1A		+	1.9	1.8	2.5	.4
1437	E512N465	34	WS		1A			.7	2.0	1.3	.3
1453	E512N465	37	TWS		1A		+	1.3	2.3	1.7	.4
1633	E512N466	32	TWS	1	1A			5.3	3.1	2.7	.8
1548	E512N468	30-40	TWS	1	1A			1.8	2.1	2.3	.6
1575	E512N469	30-40	TWS	1	1A, 2P	1A	+	4.7	3.8	2.9	.6
1387	E512N471	30-40	TWS			1A	+	1.7	2.8	1.8	.4
1451	E512N465	40-50	WS		1A			4.5	2.8	3.8	.6
1499	E512N467	45	TWS		1A			4.2	2.0	3.8	.8
1861	E513N464	20-30	TWS	1WX	1A			9.6	3.4	2.5	1.3

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Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
1862	E513N464	20-30	WS		1S			6.2	3.5	2.5	.9
1661	E513N465	25	TWS	2	1S			6.8	3.8	2.4	1.0
1662	E513N465	29	TWS	1	1A		+	6.3	2.7	3.1	.8
1292	E513N466	20	WS		1S			2.1	2.9	1.3	.6
1295	E513N466	20	WS		1A			.8	1.9	1.3	.2
1297	E513N466	20	WS	1	1A			1.2	2.0	1.2	.4
1304	E513N466	20-30	TWS	1	2A			3.2	2.8	2.5	.5
1306	E513N466	24	TWS		1A		+	1.0	1.7	1.7	.3
1308	E513N466	24	WS		1S	1A		7.2	3.2	3.1	.7
1309	E513N466	26	TWS	1	1A		+	1.2	2.3	1.6	.5
1239	E513N467	20-30	TWS		1S		+	1.2	2.4	1.5	.4
1246	W513N467	22	TWS			1S	+	6.8	3.7	1.7	1.1
812	E513N468	20-30	TWS		1A		+	2.1	2.7	1.8	.4
815	E513N468	22	TWS		1S	1A	+	1.3	2.5	1.6	.2
816	E513N468	22	WS		1A			1.6	2.1	1.9	.3
818	E513N468	27	TWS		1S			8.6	3.8	2.7	.9
680	E513N469	20-30	TWS	1	1A, 1S		+	1.5	2.7	1.4	.4
981-2	E513N470	20-30	TWS	1	1A, 1S		+	1.2	2.3	1.7	.3
982	E513N470	20-30	WS	1		1S, R		.5	1.8	1.5	.2
993	E513N470	20-30	TWS			1A	+	2.4	3.8	1.1	.7
986	E513N470	22	WS		1S			1.4	2.9	1.7	.2
983	E513N470	24	WS		1A, 1P			2.4	2.2	2.4	.5
985	E513N470	26	TWS			1A	+	4.1	3.9	2.5	.4
984	E513N470	27	WS			1S		1.6	3.1	1.9	.3
1066	E513N471	20-30	TWS			1S	+	.7	2.1	1.5	.3
1078	E513N471	20	TWS		1S		+	5.4	3.7	2.9	.8
1065	E513N471	20-30	WS		1A			.8	2.3	1.2	.2

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Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
1068	E513N471	23	TWS		1A		+	13.2	4.8	3.6	.8
1067	E513N471	28	TWS	1		1A	+	9.8	4.4	2.8	1.7
1669	E513N465	30-40	WS		1S			1.5	2.8	1.6	.4
1670	E513N465	30-40	TWS	1	1A		+	1.2	2.5	1.5	.5
1673	E513N465	34	TWS			1A, 1S	+	2.8	2.8	1.9	.6
1318	E513N466	30-40	TWS	1		1S, 1A	+	19.1	6.2	3.3	1.0
1323	E513N466	35	WS		1S			9.8	3.6	3.5	.7
1258	E513N467	30-40	TWS			1S		1.6	2.5	2.3	.2
827	E513N468	30-40	WS		1A			.8	2.5	1.1	.2
829	E513N468	31	TWS	1		1A	+	3.5	3.6	2.4	.5
688	E513N469	30-40	TWS		1A		+	.7	1.5	1.1	.2
693	E513N469	31	TWS	2		1	+	3.0	3.0	2.8	.5
691	E513N469	31	WS		2A		+	2.8	3.3	2.6	.4
694	E513N469	36	TWS		1A			2.9	2.0	2.1	.6
692	E513N469	37	TWS		1A		+	1.4	2.8	1.3	.3
1681	E513N465	40-50	TWS		1S			1.5	3.3	1.0	.5
1682	E513N465	40-50	WS	1	1A			.8	1.9	1.1	.5
1683-1	E513N465	40-50	TWS		1S, 1P			1.2	2.2	1.8	.4
1683-2	E513N465	40-50	WS	2		1S		1.3	2.1	1.8	.4
1683-3	E513N465	40-50	TWS			1A	+	5.5	3.7	2.5	.7
1684	E513N465	45	WS	2, 1WX	1A		+	18.0	5.5	3.1	1.3
1337	E513N466	41	WS	1		1A		2.3	3.2	2.3	.3
1336	E513N466	45	TWS	1	1A	1S		9.8	4.9	3.1	1.1
852	E514N468	20-30	WS		1A			17.6	4.3	3.7	1.3
883	E514N467	20-30	WS	2	1A, 1P		+	5.5	3.7	2.3	.7
884	E514N467	20-30	WS		1A, S			1.6	2.5	1.9	.3
889	E514N467	28	TWS		1A		+	2.4	3.1	1.9	.8

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Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
891	E514N467	27	TWS	1	1A		+	1.1	2.0	2.0	.3
892	E514N467	24	WS		2A			8.8	5.1	2.8	.8
464-1	E514N469	20-30	TWS	1	1A, S		+	7.5	3.7	2.7	1.2
464-2	E514N469	20-30	TWS	1	2A, P			1.8	3.1	1.4	.4
475-1	E514N469	20-30	TWS		1A		+	1.2	2.2	2.0	.3
475-2	E514N469	20-30	TWS		1A		+	.7	1.5	1.9	.2
539	E514N470	20-30	WS	2	1A, P			2.8	2.7	3.2	.4
541	E514N470	20-30	AR		1A		+	21.3	4.5	3.5	2.0
543	E514N470	23	TWS		1A		+	4.7	3.2	2.5	.7
544	E514N470	27	TWS	1	3A, 2P			3.6	4.2	1.8	.7
545	E514N470	25	WS	1	1A			6.0	3.2	3.5	.5
1146	E514N471	29	TWS		1P		+	1.1	2.2	2.0	.2
900	E514N467	30-36	TWS	1WX	1A			2.0	2.8	2.1	.5
902	E514N467	34	TWS		1A			7.5	4.1	3.1	.9
903	E514N467	31	WS		1A	1A	+	1.8	3.2	1.8	.3
904	E514N467	33	WS		1A, 1P		+	4.9	3.0	3.2	.6
484	E514N469	30-40	WS		1A			1.1	2.7	1.3	.3
486	E514N469	33	WS	1	2A, 1S		+	6.1	4.5	2.0	.8
1906	E515N466	26	WS	1WX	1A		+	6.7	3.6	2.4	1.4
1909	E515N466	29	TWS	1	1A, P		+	6.2	3.0	4.7	.7
96	E515N467	20-30	WS		1A, S		+	2.7	3.0	2.3	.3
100	E515N467	21	TWS		1A		+	5.1	2.7	3.4	.6
445	E515N468	28	WS	1WX	1A	1A	+	3.8	3.1	2.3	.7
46	E515N468	27	WS		2A, 1P			8.1	3.4	4.2	.7
397	E515N469	20-30	TWS			1A	+	1.2	1.8	2.8	.5
402	E515N469	27	TWS	1	1A, S		+	3.7	3.6	2.1	.5
511	E515N470	20-30	WS	1WX	1A	1A		4.3	2.3	3.1	.6

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
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CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
512	E515N470	20-30	AR	1	2A		+	1.2	1.6	1.5	.5
513	E515N470	20-30	WS	1	1A, P		+	2.5	2.4	3.1	.5
514	E515N470	20-30	TWS		2A		+	5.3	3.3	3.7	.5
1026	E515N471	20	TWS	1WX	2A		+	5.9	3.8	2.5	.8
110	E515N467	30-40	TWS	1	1A	1A	+	2.2	1.6	2.6	.5
111	E515N467	30-40	TWS		1A		+	1.2	2.1	1.8	.4
451	E515N468	30-40	WS		1P	1A		3.4	3.1	2.5	.4
387	E515N469	30-40	AR	1WX	1A		+	3.5	2.8	2.9	.5
389	E515N469	31	WS	1	1A, P		+	3.4	1.8	2.8	.5
390	E515N469	33	WS	1WX	1A, P	1A		6.7	3.6	2.4	.9
391	E515N469	32	TWS	2	1A			28.1	5.8	5.6	1.3
218	E517N469	53	TWS		1A, S	1A	+	2.1	2.4	1.9	.5
4979-1	E516N467	20-30	TWS		1A		+	2.6	3.3	2.2	.4
4979-2	E516N467	20-30	TWS	2	1A		+	2.3	2.5	1.7	.6
4979-3	E516N467	20-30	TWS		1A, 1P		+	1.2	2.3	1.0	.6
370	E516N468	22	TWS	1WX, 2	1A		+	7.7	4.3	3.1	.6
328	E516N469	20-30	TWS		1A		+	1.1	2.8	1.5	.4
334	E516N469	29	TWS	3	1A, P		+	4.2	2.7	3.2	.9
330	E516N469	20-30	TWS		1A, P			.7	1.1	1.7	.2
624	E516N470	20-30	TWS		1A		+	1.9	3.0	1.8	.5
1118	E516N471	20-30	TWS		1A, 1A, S		+	3.5	2.1	3.5	.7
41	E516N467	30-40	TWS	1	1A		+	1.9	1.9	2.2	.6
377	E516N468	30-40	TWS	1	1A, P		+	1.3	2.1	1.8	.3
331	E516N469	30	TWS	2	1A			21.6	5.9	4.3	1.0
715	E517N468	20-30	TWS	1	1A, 1P			1.4	2.1	1.6	.3
714-1	E517N468	20-30	WS	1	1A			1.4	1.7	1.9	.5
714-2	E517N468	20-30	WS		1A, P			1.2	2.0	2.0	.3

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170.
Page 13.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight	Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
724	E517N468	24	TWS	1WX	1A, P, S	1A, S		2.1	2.0	2.3	.9
227	E517N470	20-30	TWS	1	1A		+	4.8	2.4	1.8	1.5
1104	E517N470	20-30	TWS	1	1A		+	2.5	2.5	2.7	.4
1100	E517N470	21	AR	1WX	1A,R,1A,1P			9.5	4.1	3.6	1.2
1012	E517N471	20-30	WS	1	2A			1.0	2.1	1.8	.2
188	E517N467	30-40	TWS	1	2A	1A	+	4.3	3.9	3.0	.5
187	E517N467	30-40	TWS	1WX, 1	1A, S		+	7.6	3.5	3.5	1.0
720	E517N468	30	TWS		1A, P	1A	+	6.8	2.7	3.9	.7
731	E517N468	33	TWS		1A, P	1A	+	3.5	2.4	2.9	.6
769	E518N467	27	TWS		1A,S,2P		+	9.6	4.3	3.5	.9
243	E518N468	20-30	UNID	1	1A	1A	+	5.9	2.8	3.2	.7
249	E518N468	20-30	TWS		1A,S		+	1.7	2.2	2.3	.4
648	E518N470	20-30	WS	2		2A, S		7.8	4.1	2.5	.9
649-1	E518N470	20-30	WS	1	1A, P			3.1	2.4	2.7	.5
649-2	E518N470	20-30	WS		1A	1A		1.3	2.0	1.8	.3
650	E518N470	20-30	TWS		1A		+	1.2	1.5	1.8	.5
651	E518N470	27	WS	2	1A		+	3.3	3.0	2.8	.4
652	E518N470	27	TWS	1	1A, S, P			3.8	3.7	2.7	.4
17	E518N468	30-40	TWS		1A, P		+	4.1	3.4	2.9	.4
256	E519N466	30-40	TWS	1	1A, P		+	2.0	2.8	2.4	.5
594	E519N466	20-30	WS	1	2A, 1P		+	6.8	2.7	3.6	.7
602	E519N466	25	TWS		1A, S, 1A		+	3.6	2.6	2.9	.6
603	E519N467	21	TWS		2A		+	5.5	3.0	3.0	.6
566	E518N469	20-30	TWS		1A		+	4.0	2.6	2.5	.8
273	E519N470	21	AR		1A, 1P		+	4.6	2.9	2.7	.7
1174	E535N350	24	TWS	1WX	1A	1A	+	4.5	2.5	2.9	.8
1815	E539N350	20-30	WS	1	1A			2.1	3.6	1.6	.4

(continued)

Table 69. Descriptive data for edge-modified flakes at 23JA170. Page 14.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	WEAR AND EDGE SHAPE*** Convex Straight Concave	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS (cm) Length	Depth	Thick-ness
608	E519N466	32	AR	1, 1WX	1A, S		14.5	4.9	4.0	.9
601	E519N466	30-40	WS		1A		1.0	1.9	1.1	.4
572	E519N467	30-40	WS	1	1A	+	10.p	3.6	3.2	1.2
573	E519N467	31	TWS	3	1A	+	6.2	2.7	2.1	1.1
140	E519N469	34	TWS	1	1A		6.8	4.1	3.3	.7
1177	E519N470	30-40	TWS	2	1A, P	+	7.1	3.2	2.4	1.0
579	E519N467	40-50	TWS	2WX	1A, P		7.6	3.0	4.1	.9
589	E519N467	45	WS		1A, P		1.8	2.3	1.6	.4

*Material type: (AR) Argentine, (WS) Winterset (blue), (TWS) Winterset (tan), (WV) Westerville, (UNID) unidentified.
**Cortex surfaces: (WX) Weathered.
***Edge wear: (A) Attrition, (S) Step flake, (R) Retouch, (P) Projection.

modified flakes are smaller. Width and thickness are the most uniform variables.

Tan Winterset chert comprises 58 percent, blue Winterset 37 percent, and Westerville one percent of the edge-modified specimens. Only one flake was of an unidentified chert, possibly derived from the Mississippian strata of central Missouri. Sixteen Argentine flakes (four percent) were recovered. Heat discoloration was exhibited on 57 percent of these specimens. Cortex surfaces remain on 50 percent of the edge-modified flakes.

Manufacturing Debris

Cores (n=39)
This group of artifacts consists of tabular and nodular chert forms which exhibit platform preparation and the removal of flakes (Fig. 137). Statistical data are presented in Table 70. This artifact category represents the lithic raw material used for the production of unifacial and bifacial tools at 23JA170. Length, width, and thickness appear relatively uniform. The cores range from slightly modified tabular slabs and nodules to heavily reduced chunks.

Tan Winterset comprises 56 percent and blue Winterset 35 percent of the assemblage. Cortex surfaces were present on all but one core. Heat discoloration was exhibited on 21 percent of the cores.

Hammerstone (n=2)
Two angular chert cores exhibit pecking and shattering indicative of use as hammers. These tools may have functioned in initial core reduction stages. One hammerstone is made of blue Winterset, and one of tan Winterset chert. Neither exhibits heat discoloration.

Debitage (n=16,025)
The vast majority of lithic debris at 23JA170 is waste material from tool manufacture. Unworked flakes comprise 43 percent, angular chunks 30 percent, and small pieces of shatter 27 percent of this assemblage. Due to the small size of much of this debris, lithic source identification for Kansas City area cherts is difficult, if not impossible, to determine. It is estimated that 80 percent of the debitage at 23JA170 consists of locally derived tan Winterset chert.

Ground Stone Tools

The 23JA170 ground stone tools are made from sandstones and quartzites which were probably collected from glacial till deposits along the Missouri River trench. These stone tools were used for grinding of plant foods, for smoothing or abrading of stone, bone, or wood materials, and as anvils for the pecking or pounding of foods and other materials. These artifacts are classified as manos, metates, and abraders, based on the worked surface configurations and type of wear. Several artifacts exhibit a combination of worked surfaces.

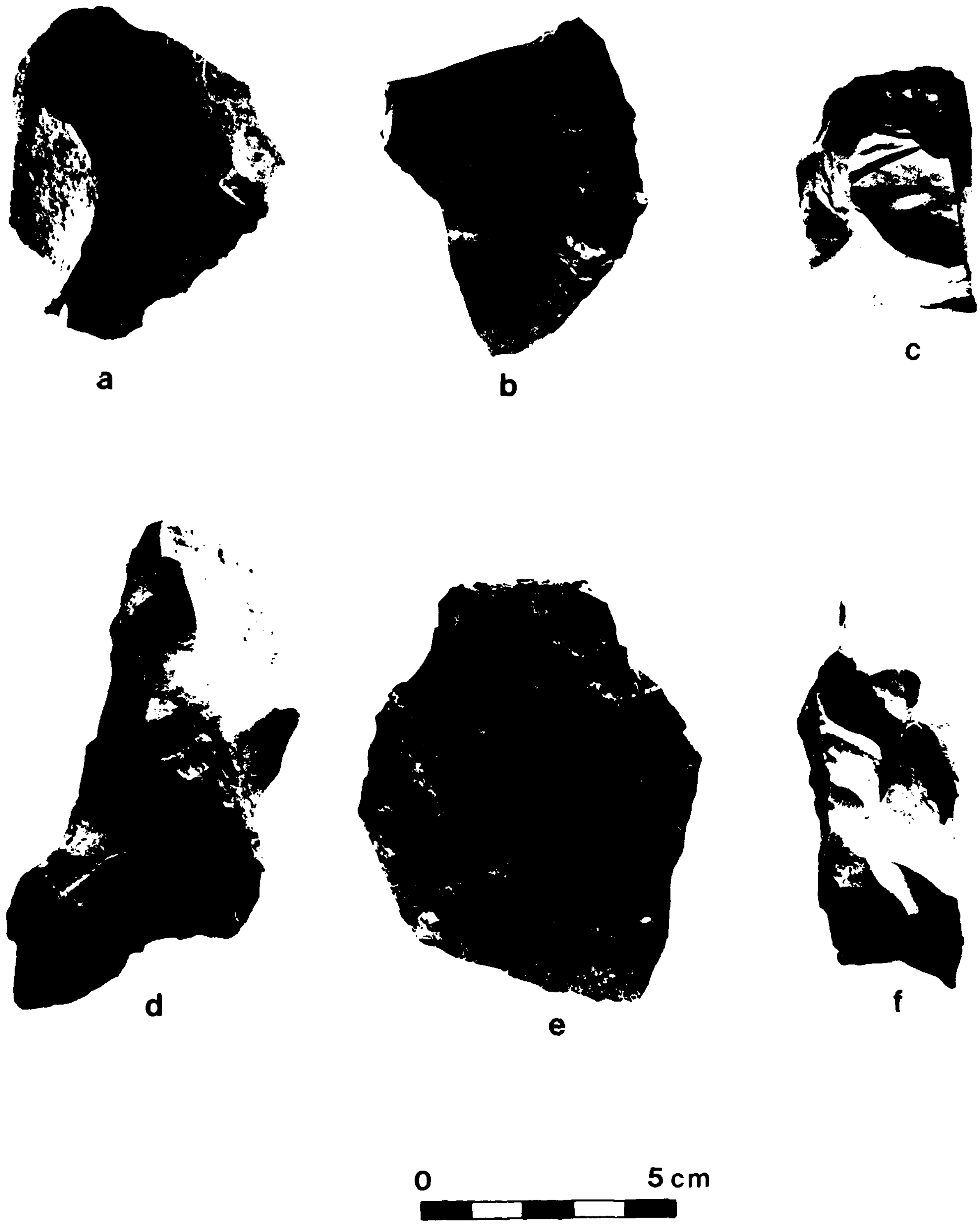


Figure 137. Cores from 23JA170.

Table 70. Descriptive data for cores at 23JA170.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS Length	Depth	Thickness
1872	E500N439	14	TWS	1	+	62.3	5.3	5.0	2.7
1873	E500N439	15	WS	2		116.3	6.5	5.6	2.8
1760	E509N429	16	TWS	2		45.8	5.2	3.8	1.9
1777	E510N410	13	TWS	5		188.4	8.0	7.7	3.4
305	E510N465	30	TWS	2		75.5	5.6	6.7	3.4
1845	E512N464	33	WS	1		77.2	6.5	4.9	3.0
1394	E512N465	0-10	WS	5		72.3	5.8	3.8	2.6
1620	E512N466	30-40	TWS	3		24.7	3.6	4.7	1.5
1490	E512N467	20	TWS	5		568.4	12.1	9.3	5.0
547	E512N468	30-40	TWS	1		30.5	4.9	3.1	2.4
1212	E512N470	24	WS	3		104.8	5.3	6.2	2.8
1373	E512N471	25	WS	4		54.0	6.0	5.3	1.2
1652	E513N465	12	TWS	3		188.5	8.8	6.3	4.3
1674	E513N465	31	TWS	2	+	77.7	10.4	4.0	2.4
1294	E513N466	13	TWS	1		50.0	5.6	3.8	2.0
1316	E513N466	30-40	TWS	4		61.6	6.3	5.3	1.8
1243	E513N467	26	TS	3		22.5	5.2	3.0	1.5
905	E514N467	32	TWS	3	+	57.7	7.9	2.8	2.2
112	E515N467	35	TWS	1		36.8	5.2	4.6	1.3
515	E5.5N470	28	TWS	3		44.2	5.3	3.7	2.4
54	E516N467	30	TWS	4		158.7	7.0	5.7	4.1
53	E516N467	27	WS	1	+	17.1	3.5	4.7	1.5
371	E516N468	27	TWS	2		208.6	8.3	7.0	4.1
361	E516N468	14	WS	3		22.6	5.1	3.1	1.5
322	E516N469	10	TWS	2		34.8	5.5	3.8	1.9
1724	E517N460	30-40	WV	2	+	31.8	6.1	3.2	2.4
207	E517N469	10	TWS	5		42.5	3.6	5.0	1.9

(continued)

Table 70. Descriptive data for cores at 23JA170.

CATALOG NUMBER	PROVENIENCE	SURFACE DEPTH	MATERIAL TYPE*	CORTEX SURFACES**	EDGE WEAR***	HEAT DIS-COLORATION	WEIGHT (g)	DIMENSIONS Length	Depth	Thickness
280	E518N469	31	WV	2	1A,S		10.6	2.6	2.7	1.5
279	E518N469	30	WS	2	1A		40.8	5.5	3.7	2.0
281	E518N469	35	TWS	5	1A		29.2	6.7	3.5	1.2
282	E518N469	34	WS	1	-	+	20.3	3.0	3.9	2.0
129	E519N469	13	WV	1	1A		40.2	3.8	6.0	2.0
1101	E517N470	11	WV	2	1R,S		36.3	3.7	5.0	1.9
1173	E519N470	20	TWS	2	1A,S;1R		25.5	5.6	3.0	2.3
139	E519N469	20	WS	4	-	+	28.1	4.5	4.9	1.0
144	E519N469	23	TWS	1	1A		150.5	10.0	6.0	2.5
1178	E519N470	32	WS	3	1A,S		136.8	7.8	4.8	4.2
1686	E524N410	19	WS	2	1R,A		59.5	7.0	3.5	2.4
1729	E527N463	0-20	TWS	3	-		25.6	4.4	3.5	1.9

*Material type: (TWS) Tan Winterset, (WS) Blue Winterset, (WV) Westerville.

Mano (n=1)

Only one artifact was recovered which can be classified as a hand-held mano or grinding stone. This artifact is made of a pink quartzite (Fig. 138b) and is similar to the Nebo Hill specimens illustrated by Shippee (1968:22) and Chapman (1975:201). One surface is highly polished and slightly convex, the other is pecked, slightly smoothed, and slightly concave.

Metates (n=3)

Three fragmentary artifacts are interpreted as metates or grinding slabs (Fig. 138a,d), based on the fine polish and degree of curvature exhibited. Two of these are made of micaceous sandstone, and one is a gray quartzite. These tools are probably fragments of thick rectangular metates. No evidence of heat discoloration is exhibited.

Abraders (n=3)

Three artifacts were classified as abraders (Fig. 138c,e-g). One artifact is interpreted as a complete artifact due to the degree of curvature shown on the ground face and the facility by which it could have been hand-held. This artifact may have served as a shaft smoother. One fragmentary artifact exhibits linear grooves and probably served as a sharpener for pointed wood or bone artifacts. The third abrader is a fragmentary piece of sandstone with slight evidence of abrasive wear.

Minerals

This artifact category consists of 45 small pieces of unworked hematite and 3 pieces of limonite. Both minerals probably occur within the limestone bedrock of the area and may have been collected and brought to the site by the Nebo Hill occupants for use in paint or pigment manufacture. Subsequent weathering of the mineral surfaces may have removed any evidence for working of these minerals. These minerals have been recovered at other Nebo Hill sites (Reid 1978, Reeder 1978).

Bone

Fourteen very small fragments of uncarbonized and unidentifiable bone were recovered at 23JA170. These specimens may represent food remains of the Nebo Hill occupants.

Charcoal

Twenty-six fragments of charcoal were recovered during the field excavation. None were in secure association with occupation levels or features. This charcoal may be a part of the general site occupation midden or simply the deposit.

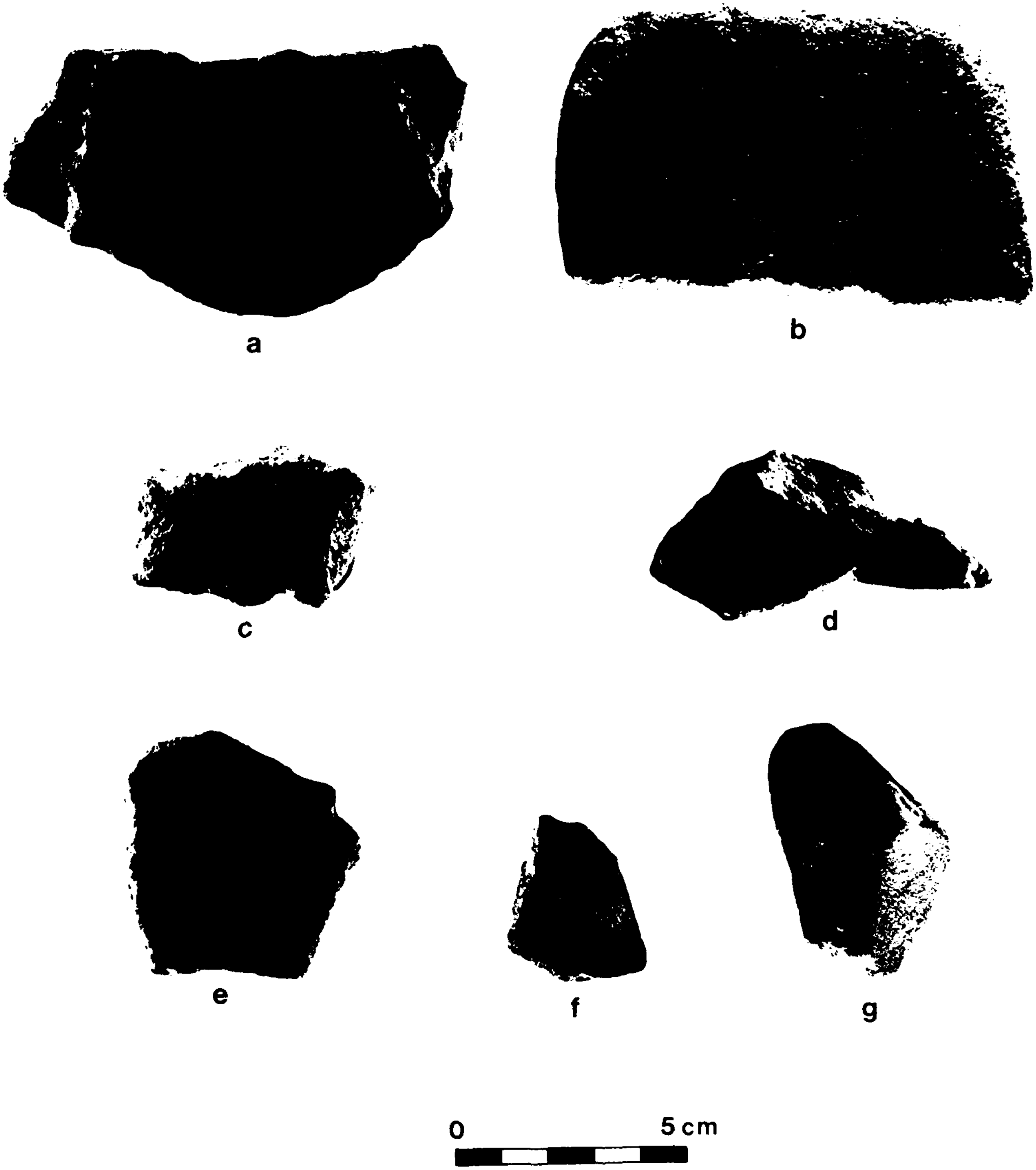


Figure 138. Groundstone tools from 23JA170: (a) metate, (b) mano, (c) abrader, (d) metate fragment, (e-g) abraders.

Other Classes of Materials

This artifact class consists of organic and inorganic debris which were recovered during the 1979 field excavation and screening. Artifact categories include unworked stone, gastropod shells, seeds, and modern coal and metal.

Unworked Stone (n=3427)
This category consists of unworked stone, primarily small chert, limestone, and shale fragments. This stone may have been introduced into the cultural deposit by modern cultural or natural processes; a high correlation exists between the distribution of debitage and the unworked stone, suggesting that the Nebo Hill occupants may have deposited the unworked stone.

Shell (n=10)
Ten small gastropod shells were recovered. These specimens were natural intrusions into the deposit.

Seeds (n=10)
Eight uncarbonized and two carbonized seeds were recovered. These specimens were apparently deposited during the modern period as a result of the burning of old fields and turning under the plant remains.

Modern Debris (n=38)
This artifact category consists of 95 percent coal and five percent metal. These artifacts are derived from modern activities and plowing at the site. The majority of these remains were recovered in the plow zone, but several specimens were recovered from a depth of 40 cm. This may be explained by vertical displacement of artifacts by soil organisms or other soil disturbing phenomena.

Flotation Sample

Flotation samples were taken in the block excavations at 23JA170. Each sample was a standard volume of four liters. Selected samples were taken within a checkerboard sampling strategy for each 10 cm level. Based on the amount of organic remains noted at the base of the plow zone in the 20-30 cm level, this level and the surface level were discarded because of the obvious modern contamination.

The 30-40 cm level contained predominantly uncarbonized seeds, plant stems, grass fibers, and rootlets in all units and all levels sampled. The 40-50 cm level was sampled only in the southern 1/3 of the block because cultural material was recovered primarily in this area. No bone and only small amounts of gastropod shells were recovered in the flotation samples.

The seeds recovered in the flotation sample are interpreted as intrusive into the archaeological deposit at the site. The presence of historic coal and metal to a depth of 40 cm and the co-occurrence of plant stems, grass blades, and root hairs support this interpretation.

Several samples of representative seeds have been selected for analysis to determine the species present. As these seeds are not related to the

prehistoric occupation at the site, it was deemed unnecessary to analyze all these samples and attempt subsistence/seasonality reconstructions. The most likely explanation for the presence of these materials so deep in the soil at 23JA170 is the modern practice of burning off the ground cover on fields, then turning the carbonized material under. Layers of carbonized and uncarbonized plant remains were noted at the base of the plow zone during the excavation. Subsequently, these materials could have been translocated deeper through the action of soil organisms, plant roots, and animal tunnels.

DISCUSSION AND INTERPRETATIONS

23JA170, located on an upland bluff of the upper Little Blue Valley, was the subject of intensive data recovery investigations in 1979. A total of 20,240 artifacts were recovered during this investigation. The site represents a single component Late Archaic Nebo Hill occupation.

Based on the previous descriptions of various chert, sandstone and quartzite artifacts recovered during the 1979 investigations at 23JA170, a range of cultural and subsistence activities can be reconstructed. A study of tool morphology and edge-wear attrition indicates that chipped and ground stone tools served a number of functions for the Nebo Hill complex inhabitants of the site.

Non-local chert dominates the projectile point assemblage. Westerville chert and cherts thought to have originated from the Mississippian geologic strata of central Missouri are the more frequent types. Local tan and blue Winterset cherts were probably used to refurbish the projectile point tool kit, with the finished products being taken from the site.

The recovered projectile point assemblage is interpreted as the end product of a projectile point reutilization trajectory. Sixty percent of the assemblage consists of stem fragments while only 27 percent are tips. As indicated in a recent study of the Agate Basin kill site, stem fragments of broken points are more regularly removed to base camps as a result of being attached to foreshafts (Peterson 1978). Bradley (1974) has stated that a common practice may have been to resharpen points while still hafted in their foreshafts. The lanceolate projectile point is ideally suited for reworking, and as a result, at least within the Agate Basin complex, fragments were regularly reworked and returned to service (Peterson 1978). Evidence from the 23JA170 point assemblage shows that attempts were made to rework a number of points with broken tips. The high occurrence of broken stems at the site indicates that foreshafts were brought back to the site, stems discarded, and new points manufactured.

Reid (1978) suggests that the high incidence of thermal alteration noted on the distal ends of broken points may have been due to attempted resharpening of points while still hafted. Broken projectile points at 23JA170 also show a high incidence of heat discoloration and fracturing, in conjunction with evidence of resharpening.

The various Nebo Hill point shapes recovered at 23JA170 reflect a bifacial resharpening trajectory. Although Shippee (1964) interprets the various Nebo Hill point forms as representing distinct cultural groupings and temporal variation, the bifacial reduction hypothesis is more likely. Such a resharpening reduction trajectory for early Archaic forms has been experimentally demonstrated by Goodyear (1974).

The uniform basal widths of the 23JA170 points indicate that this is an extremely homogeneous collection. The similar lengths of the broken point stems indicate that they were inserted to equal depths in their hafts. The uniform stem breakage and fracture patterns producing transversely broken stems, midsections, and tips may have been produced by a socket hafting technology. This hypothesis should be experimentally tested with future research and through replication studies.

Other classes of chipped stone tools recovered from 23JA170 were dominated by local tan and blue Winterset cherts. Large oval and lanceolate bifaces are interpreted as butchering or wood working implements, used for a variety of light and heavy duty cutting tasks.

Distinctive forms of drills were recovered at 23JA170. The rectangular base form with a narrow tip has been reported in several Nebo Hill contexts as well as other Late Archaic assemblages (Chapman 1975). These tools were probably used as hafted drills. The lipped transverse fractures indicate considerable force in the use of these tools. At least one hypothesized task for these tools would have been drilling sockets for hafting lanceolate points and sockets for the insertion of dart foreshafts into the main shaft of the dart missile.

Flake tools served a variety of functions, primarily light duty tasks. Engraving tools were probably used to incise, cut, or split wood, antler, or bone. Scrapers were used to trim bone or wood materials. Flakes were also used as cutting tools, and a relatively few were used as light duty drills. Due to the prevalence of straight working edges and relative absence of convex or blunted working edges, few of these flake tools were suitable for the working of skins.

Tabular and nodular cores are locally derived rock forms used for the extraction of flake tools and the manufacture of bifacial tools. This heterogenous class of artifacts is represented by slightly modified to heavily reduced cores.

The ground stone artifact class is dominated by non-local sandstones and quartzites. These tools served as hand-held manos and stationary grinding basins and anvils. Abraders were used for smoothing objects such as wooden shafts as well as sharpeners for pointed wood or bone artifacts. The griding stone category probably served a function in food preparation. No mineral stains were noted on the working surfaces, but these grinding stones may also have been used to grind hematite and limonite into pigments. Pecked working surfaces may have served as anvils for percussion flaking or in food preparation.

Interpretations

The 23JA170 cultural deposit is relatively thin, with several areas of artifact concentrations in the site. No cultural features such as pits or hearths were discovered. The projectile points are homogeneous lanceolate forms. Several points represent the end stage in a projectile point re-utilization trajectory, and the majority of these point are stems which broke during use at uniform lengths. Based on these data, 23JA170 represents a single component Nebo Hill complex occupation. Surface material is estimated to cover an area of 15,000 sq m (1.5 ha). Cultural material was recovered to a depth of 50 cm. The majority of artifacts were recovered between 18 and 30 cm. No cultural features were located during the 1979 investigations at the site. Less than one percent of the site has been excavated.

Based on an analysis of the material culture, the 23JA170 site was a base camp. In this sense, the site served as a wood and stone tool maintenance area as well as a short term habitation. In addition, plant and animal foods were processed and consumed at the site.

The projectile point assemblage is dominated by chert types which are derived from source areas at relatively long distances from the site. Several of the points made from these chert types have been resharpened to various degrees and repeatedly heated, causing thermoclastic damage to some. These factors indicate that projectile points were curated for relatively long periods of time. Utilitarian artifacts were made of local cherts and were apparently discarded at a more rapid rate. The manufacturing debris at the site is composed almost entirely of local cherts.

The implications of the chert origins and the projectile point reuse trajectory have a greater significance in the interpretation of the settlement-subsistence practices of the 23JA170 inhabitants. A highly mobile existence is suggested by the reuse and curation of points. The use of non-local cherts for the projectile points and not for other tools, as well as the presence of non-local sandstones and quartzites, indicate long distance group movement, or conversely, travel by individual specialists. The existence of extensive trade networks cannot be discounted.

The study of prehistoric hunter-gatherers has made frequent use of ethnographic analogies in order to widen the horizons of archaeological interpretations. Most of the analog models currently in use by anthropologists and archaeologists have been derived from the study of African band societies and then equated to the North American environment. Such analogs have served to provoke the recognition of more comprehensive ranges of order in the archaeological record.

Hunter-gatherer groups operate within both social and spatial boundaries. Spatial boundaries range from identifiable territories such as river drainages to entirely fluid population movements (Peterson 1976). Yellen and Harpending (1972:244) state that "hunter-gatherers are characterized by a very fluid patterning of population distribution over the land, and that the classic notion of the 'band' is more aptly applied to primitive agriculturalists."

In general it has been observed that hunter-gatherer occupational debris accumulates in extremely thin layers. Residue at a seasonally occupied hunter-gatherer site would be expected to accumulate gradually. Activity areas are represented by concentrated zones of refuse and debris. In addition to thin occupations debris, current research indicates that the life history of individual artifacts have a strong bearing on typology, utilization patterns, and reconstruction of weaponry. The presence of projectile points which have been secondarily reworked from original points can be taken to indicate group movement and point reuse in a circumstance where lithic materials were not available for new points.

The presence of imported lithic materials at a given site may be a reflection of the lack of suitable local materials. Such exotics may also indicate the drifting and dividing patterns of certain individuals or small camps of individuals, rather than acquisition through trade networks or through lithic resource procurement expeditions. In their study of Late Stone Age and contemporary Bushmen artifact distributions, Yellen and Harpending (1972) conclude that almost no social nucleation exists among hunter-gatherer groups, and that tools found at great distances may have been made by the same individual.

Based on the data discussed in this report, the Nebo Hill complex inhabitants of 23JA170 were practicing a wandering hunting and gathering subsistence strategy. The cultural deposit at the site was created within a relatively short period of time, with the people camping on the currently exposed ground surface, camp debris accumulating around the living area, subsequent abandonment of the site, and eventual shallow burial of the deposit by aeolian processes. The lithic sources used for the projectile point and grinding stone assemblage indicate movement of the group or individuals across the region from Central Missouri River to the headwaters of the Little Blue River in southern Jackson County. The incidence of secondarily reworked projectile points indicate that they were curated and maintained for extensive periods of time. The high incidence of local lithic debris at the site and few points of local material indicates that most of the locally made points were then removed from the site.

Summary

23JA170 has proven to be extremely significant in terms of the information provided on the behavioral patterns of Nebo Hill groups. The site provides data on the artifact assemblage of Nebo Hill base camps and the territorial range of these groups of people. The site specific studies of Reid (1978) and Reeder (1978) and this study at 23JA170 are initial steps in the formulation of a regional scale model of Nebo Hill settlement-subsistence strategies. Nebo Hill sites, although frequently found on upland bluffs, are also found on bottomland terraces. These sites are characterized by apparently seasonal site occupations, indicating group mobility, and suggest intersite relationships or cultural contact. 23JA170 served as an integral part of the Nebo Hill Complex settlement-subsistence strategy. Its location on the upland bluff served to maximize the availability of woodland and prairie plant and animal species and local chert sources for the renewal of tool kits.

The site should be preserved from any extensive land modification or development. It is recommended that grass or native prairie vegetation be established on the site. The establishment of an interpretive exhibit at the local ranger station or a visitor center would aid in conveying to the public the historical and scientific significance of the site.

CHAPTER XIV

THE TURNER-CASEY SITE (23JA35)

Larry J. Schmits and Christopher A. Wright

INTRODUCTION

The Turner-Casey site (23JA35) is a large upland Nebo Hill site situated on a bluff overlooking the East Fork of the Little Blue River. The site covers 50,000-60,000 sq m and is one of the largest known sites in Jackson County. Turner-Casey has been known to local artifact collectors and was briefly investigated and reported on in the 1960s. As a result of the proposed construction of Blue Springs Lake, the site was tested in 1976 by the University of Kansas and recommended for extensive excavation (Brown 1977). Phase III data recovery investigatons at the site were conducted in 1979 by Soil Systems, Inc., as part of a cultural resource mitigation project for Blue Springs and Longview Lakes. The primary objective of the investigations at 23JA35 was a reconstruction of Nebo Hill settlement-subsistence and lithic procurement patterns along with the recovery of organics suitable for radiocarbon dating.

DESCRIPTION OF THE SITE AND LOCAL ENVIRONMENT

The Turner-Casey site (23JA35) is located on an upland divide or interfluvial overlooking the East Fork of the Little Blue Valley approximately 30 km south of the confluence of the Little Blue and Missouri Rivers. This divide is formed by the juncture of the East Fork and the main stem of the Little Blue River 4.7 km north of the site. The east side of this divide facing the East Fork is characterized by numerous northeasterly trending ridges separated by intermittent tributaries leading to the river. The dissection of the valleys through bedrock, especially resistant layers of Bethany Falls Limestone, has resulted in the formation of steep slopes, bedrock ledges, and rocky wooded ravines on the northeast and south sides of the site. Overhangs of Bethany Falls bedrock are especially pronounced on the east side of the site forming rockshelters such as at 23JA37.

The headwaters of the small tributary valleys on either side of 23JA35 are located about 1200 m to the northwest and south of the site in rocky rolling uplands. The northeasterly trending ridge or upland valley projection on which the site is located is defined by these two valleys. The ridge extends from the flood plain of the Little Blue on the northeast for a distance of about 1100 m to the southwest (Fig. 139). The distance between the two tributaries near the headwaters is about 1450 m; this distance is

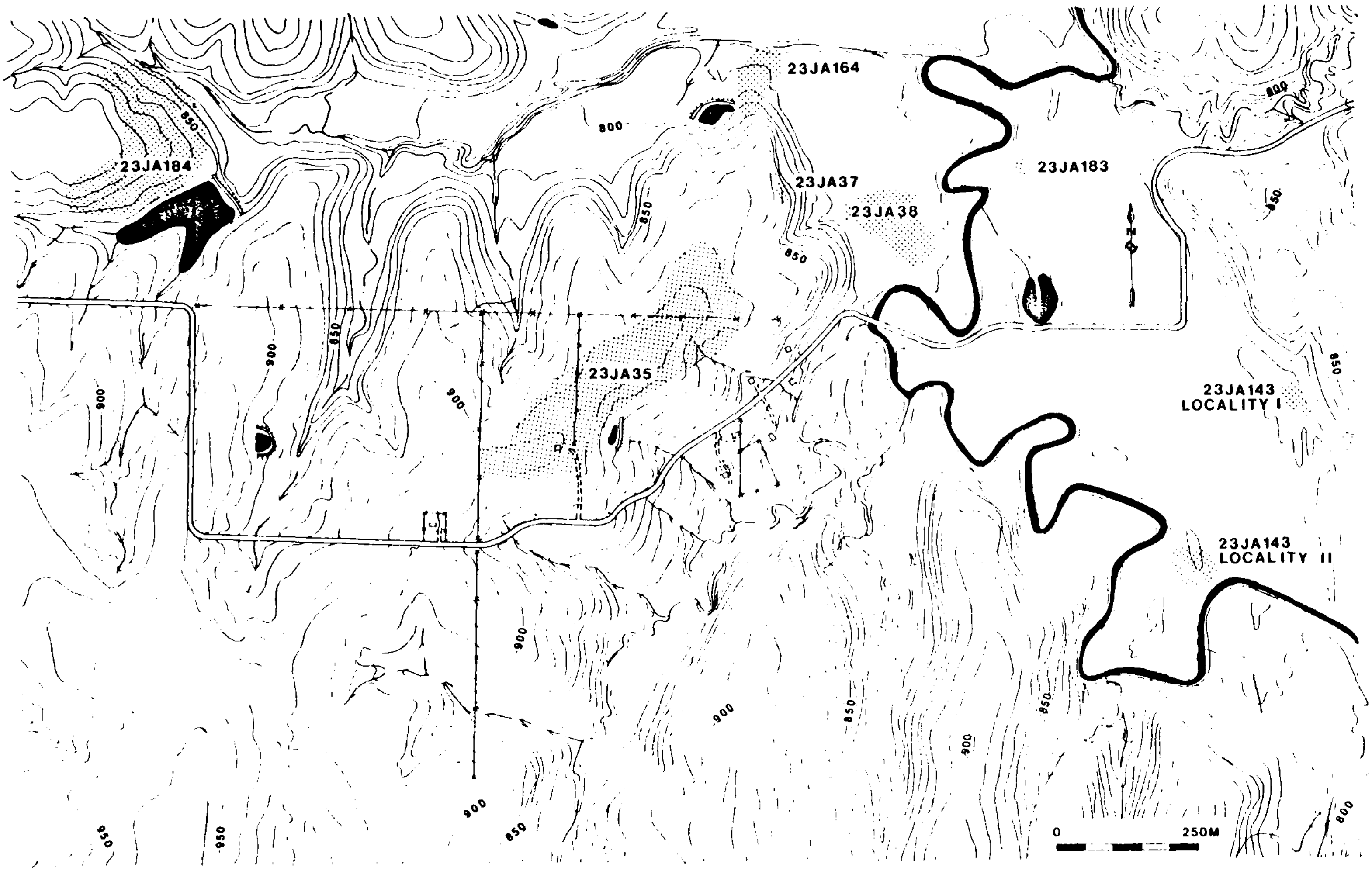


Figure 139. Location of the Turner-Casey site (23JA35) and other nearby sites.

about 375 m on the northeast bluff overlooking the Little Blue River. This bluff is steep in its slope to the flood plain of the Little Blue River. The ridgetop itself is relatively flat. The north, east, and south sides of the ridge are dissected by steep wooded ravines.

The East Fork of the Little Blue River is a small mud and gravel bottomed meandering stream. Based on map and air photo interpretations, Kopsick (this volume) has been able to define two surfaces on the Little Blue River. The present flood plain (T-0) is restricted to a narrow area closely paralleling the modern channel. The major portion of the flood plain is comprised by the T-1 terrace and is elevated several m above the T-0. Based on typologically dated archaeological sites and C-14 dates, aggradation of the T-1 terrace ceased by Middle Woodland times (ca. 2000 B.P.). The surface of the T-1 terrace exhibits numerous scrolls, oxbow lakes, and depressional areas resulting from previous meandering of the Little Blue River. At the time Turner-Casey was occupied, the elevation of the flood plain was considerably lower. Sufficient information is not presently available to determine whether this flood plain of ca. 4000-5000 B.P. was characterized by a meandering fluvial system similar to the one presently in the area.

The present land use of the area of the site has been for pasture and cultivation. A north-south fence on the quarter section line along the western side of the site marks the known western boundary of the site (Fig. 139). This fence also marks the Corps of Engineers property line. The site may well extend to the west of this fence. The area to the east of this fence extending across a pasture and past a second north-south fence and south of an east-west fence is referred to as Area A. Local informants indicate that for the last 75 years or so this area has been used for pasture. Prior to 75 years ago, this area was cultivated. A rectangular field to the northeast of Area A is referred to as Area B. This field was in cultivation prior to its acquisition by the Corps of Engineers in the mid-1970s. The area to the north of the field is referred to as Area C. This area is wooded and according to local informants is not known to have ever been in cultivation. Several terraces have been constructed along the east side of Area C to divert drainage to a pond to the north.

The stratigraphy at 23JA35 consists of a Pleistocene loess cap overlying Pennsylvanian bedrock of the Kansas City group. This loess cap is thickest near the summit of the ridge and pinches out near the slope. Soils formed on these deposits include the Sibley Series on the loess and the Snead on the bedrock slope.

Based on the United States General Land Office surveys conducted in 1826, the Turner-Casey site was located within a major expanse of upland prairie (Jurney: this volume, Figure 18). The present forest area to the north of the site consisted at that time of a barrens, perhaps maintained by periodic prairie fires. Lowland prairie areas were present on the flood plain of the East Fork Little Blue Valley adjacent to the site. The prevailing wind patterns in the fall and winter (when fires are most likely) were from the southwest, thus allowing the spread of prairie vegetation and barrens through the slope-upland and flood plain forest to the north of the site. The boundaries of these vegetational zones were undoubtedly in a state of constant fluctuation as a result of changes in precipitation, edaphic factors and prairie fires.

Common prairie and edge-adapted animals which would have been present in the areas of the site would include bison, wapiti, deer, cottontail, turkey and prairie chicken. Pronghorn antelope and jack rabbit may have been present during periods of extended drought. Common plants included bluestem grasses with sumac, rough dogwood or barrens fringe. On lower slopes a belt of switchgrass, Canada wildrye, cordgrass, and sunflowers often intervened between bluestem prairie and shrubs. The General Land Office Survey Records indicate that isolated groves of trees, primarily white and black oaks and hickory were common along the prairie fringe.

Three zones of woodland were located immediately adjacent to the site, barrens, slope-upland forest, and flood plain forest. Common plants in the barrens included white and black oaks, pin oak, and hickory with an understory of hazel, plum and cherry. The slope-upland forest included these same species. The flood plain forest included white and black oaks, walnut, elm, and hackberry as dominant species. Understory vegetation included sumac, plum, gooseberry, and wild grape.

Local Winterset chert is readily available from the Winterset limestone formation near the site. A major outcrop known to have been used as a quarry is located in a regolith just above a pond 730 m northwest of 23JA35 (Fig. 139). In summary a mosaic of four vegetational zones with associated varieties of plant and animal resources existed within five km of the site. Lithic resources were readily and abundantly available to the site occupants.

PREVIOUS WORK AT THE TURNER-CASEY SITE

The Turner-Casey site was first reported by W.R. Wilson in a short article in the Missouri Archaeological Society Newsletter (Wilson 1962). Wilson describes the site as being discovered by Mike and Emmett Casey while crossing a field near their home during the spring of 1961. The Caseys' showed their surface collection to Wilson, who immediately recognized diagnostic Nebo Hill points described earlier by Shippee (1948, 1957). Shippee was contacted, and the group made several additional surface collections that spring. The site appeared to them to be a single component Nebo Hill complex site.

Wilson (1962:4) reports that in mid-summer of 1961 the group learned that the site property might soon change hands and was concerned that future research at the site might not be possible. Accordingly, they sought and received permission to plow and disc the then fallow field (Area B) in order to recover additional artifacts. While plowing, Mike Casey noticed several burned limestone fragments turned up in the northeast corner of Area B. The locations of these were marked, and careful hand excavations were conducted.

Shippee, Wilson, and the Caseys were very interested in obtaining charcoal or other organic material to date the site and the Nebo Hill complex. No dates were at that time available, and Shippee (1948, 1957) had speculated, on typological grounds, that the Nebo Hill complex dated to late Paleo-Indian times.

The excavations revealed the remains of four hearths, three of which had been disturbed and somewhat scattered. Wilson indicates, however, that all hearths were below the plow zone and that the scattering must be due to other factors than plowing. Wilson briefly described three of the four hearths. Hearth 1 contained, in addition to burnt limestone, a quartzite mano but no temporally diagnostic items. Hearth 2 had a Nebo Hill point in association. Hearth 3 was undisturbed and consisted of a five-foot diameter deposit of small, bright red limestone cobbles. A deer metapodial fragment was associated with this hearth, but no charcoal or diagnostic artifacts were found (Wilson 1962).

In summary, work reported by Wilson recorded the site as a Nebo Hill complex component in an environmental setting similar to the type site described by Shippee. Artifact density was reported as high, depth of site was shallow, and disturbance was limited. Wilson also indicated that the site extended outside the plowed field by stating that "less than one-fifth of this site has been extensively studied" (1962:5).

The next investigation of the site was a short visit by Michael Heffner in 1973 as part of a contract between the University of Kansas and the National Park Service. This contract provided for initial survey and assessment of cultural resources in view of potential future impact of the then proposed Little Blue channel straightening and reservoir construction projects. Heffner (1974:29) gathered a small collection from the surface and recommended more extensive work before construction.

In June of 1976, a crew from the University of Kansas revisited the Turner-Casey site as part of a contract with the Kansas City District Corps of Engineers for an intensive survey and assessment of the proposed Little Blue Lakes area. As reported by Brown (1977:17-40), field work consisted of excavation of 10 one m square test pits, intensive surface collection, and soil sampling for phosphate concentrations. Brown describes the site as consisting of a surface scatter of approximately 100,000 sq m, of which 12,000 sq m were cultivated (the field studied by Wilson, Shippee, and the Caseys). A large portion of the site southwest of the cultivated field was in pasture, while an area northeast of the field was in timber.

Brown's test pits were scattered over Area A. The test pits showed that plowing had disturbed almost all of the deposit. While artifacts were occasionally found below the plow zone to about 40 m below surface, most were in the top 20 cm. The pasture (Area A) was shown to have been plowed also, although informants indicated not in the last 75 years. Test pits also indicated that Area A had the highest artifact density. No features were encountered in the test pits.

Soil samples were taken by Brown (1977:18) in four transects across the site for analysis of phosphate content in an attempt to delineate site boundaries and internal variability. Phosphate concentration values were interpolated, contoured, and mapped for the site (Brown 1977:33-34). Unfortunately, these maps are unclear--they are of different scale than his other maps, grid coordinates are unreadable, and site features and investigations are not shown. Brown's interpretation of these maps is that the phosphate distribution is uncorrelated with prehistoric occupation organic deposits and is related instead to erosion, leaching, and modern phosphate deposition.

Most of the effort during the 1976 investigations appears to have been involved in an intensive, controlled surface collection from the cultivated portion of the site and from portions of the pasture adjacent to the southwest. Approximately 2400 10 m squares were collected from, resulting in the recovery of more than 5800 artifacts (Brown 1977:17-18). Density maps (interpreted contours) for four artifact classes, bifaces, unifaces, debitage, and limestone, are presented (1977:27-30). Again, the maps are difficult to interpret because of their lack of site features and readability, but several clusters or concentrations of artifacts are apparent. Careful scaling and analysis of these maps indicate that the major concentrations are in the northeast corner of the cultivated field, in the west-southwest portion of the cultivated field, and in an area in pasture approximately 50 m southwest of the cultivated field.

In summary, Brown's investigations recovered a large quantity of artifacts and confirmed that Turner-Casey was a large, single component Nebo Hill complex site. While phosphate concentration studies were inconclusive, an intensive surface collection indicated that the site was shallow, and perhaps completely disturbed, especially in the cultivated field part of the site, although portions of features might still remain. Test pits also indicated that the highest artifact density occurred in the pasture area southwest of the cultivated field. Because of the rarity of Nebo Hill complex components in the project area and in the region, the site was considered to have potential for providing important data for several problem areas identified in the project research design. These included lithic procurement, manufacturing technology, tool use, subsistence and activity analysis, and culture history (Brown 1977:20). The site was recommended for excavation and study before its destruction.

Robert Ziegler, in a Master's thesis at the University of Kansas (1979), studied in detail the distribution of artifacts gathered during the controlled surface collection made in 1976. Ziegler's work focused on analysis of the artifacts from the cultivated field (Area B). He excluded those from the pasture b[illegible]e of possible visibility bias. Ziegler used factor analysis and grouping analysis in attempts to identify clusters of occupational activity and to define the actual activities carried out and the tool kits used.

Ziegler's study confirms Brown's less detailed analysis of internal site variability and indicates that large, blufftop Nebo Hill complex sites probably represent numerous reoccupations, perhaps during warm weather seasons, as hypothesized for the Nebo Hill type site by Reid (1980). Ziegler's detailed identification and interpretation of his factor and grouping analyses defined six clusters of various sizes and shapes. While these clusters exhibit distinctive differences in their factor loadings and scores for the different artifact classes used by Ziegler as variables, and thus can be interpreted as representing different artifact/tool proportions indicative of distinct activities, the differences are minor. Ziegler is cautious in interpreting these as activity areas, apparently preferring an hypothesis involving multiple occupations, perhaps of varying sizes. Ziegler's use of untransformed count data, not normally distributed, makes statistical significance testing impossible as a technique to estimate cluster distinctiveness. Further detailed analysis using more careful data control is necessary to decide this issue. The data at hand, however, indicate that the clusters or concentra-

tions most probably represent different occupations episodes, with cluster size differences related to the number of such episodes and their degree of spatial overlap.

DESCRIPTIONS OF THE EXCAVATIONS

The 1979 excavations at 23JA35 included test units in Areas A, B, and C, block excavations in areas A and C, and mechanized scraper cuts in Area A and B (Fig. 140). The test units were designed to locate concentrated areas of debris, the block to recover large samples of spatially associated remains, and the scraper cuts to open large areas so as to discover subsurface features. A grid system was laid out with a transit from the datum (E500, N500) established by Brown along the fence line of the west side of Area A (Fig. 140). Base lines were extended east and north through areas A, B, and C. The provenience of all excavation units are referred to in terms of east and north of this datum. While this grid system used in 1979 conforms to the grid set up in 1976 and used by Brown (1976) and Ziegler, there are discrepancies with the placement of the grid and other features such as fence lines presented by Ziegler (1978).

Excavation methods included the use of one by one m units hand excavated by thin shovel scraping and troweling. The units were excavated in 10 cm levels. Tools were plotted to the nearest cm. The matrix from the blocks and test units was sifted through one-fourth inch mesh screen. Four liter matrix samples were taken from each 10 cm level for flotation and waterscreening.

Area A

The excavations in Area A included 18 one by one m test units and a three by four m block. Six of the test units consisted of adjacent one by two m units. Additionally, Brown opened up five one by two m units in Area A in 1976. In all, 40 square meters were hand excavated in Area A (Fig. 140).

Brown's test units encountered a large concentration of lithic debris in E600-601, N570, and E620-621, N599. A total of 1920 and 1672 items were found in these units respectively. Brown's E600-601, N570 unit was relocated and opened. Two additional test units were placed to the north (E600, N579) and to the south (E600-601, N559) to determine the extent of this lithic concentration. Both of these units recovered a quantity of lithic material, although considerably less than was found by Brown. Based on these results, a small three by four m block was opened over Brown's old units. Excavation of this block recovered a large number of tools, lithic manufacturing debris, unworked stone, and a large amount of historic debris including broken clay pigeons and metal items such as nails. Over 96 percent of the cultural materal was concentrated in the upper 25 cm. No evidence of stratification was present. The modern historic debris was mixed with the prehistoric lithic material. Due to the shallow depth of the cultural deposit and the mixing with historic materials, Block A was not expanded further. A general view of the completed excavations in Block A is shown in Figure 141.

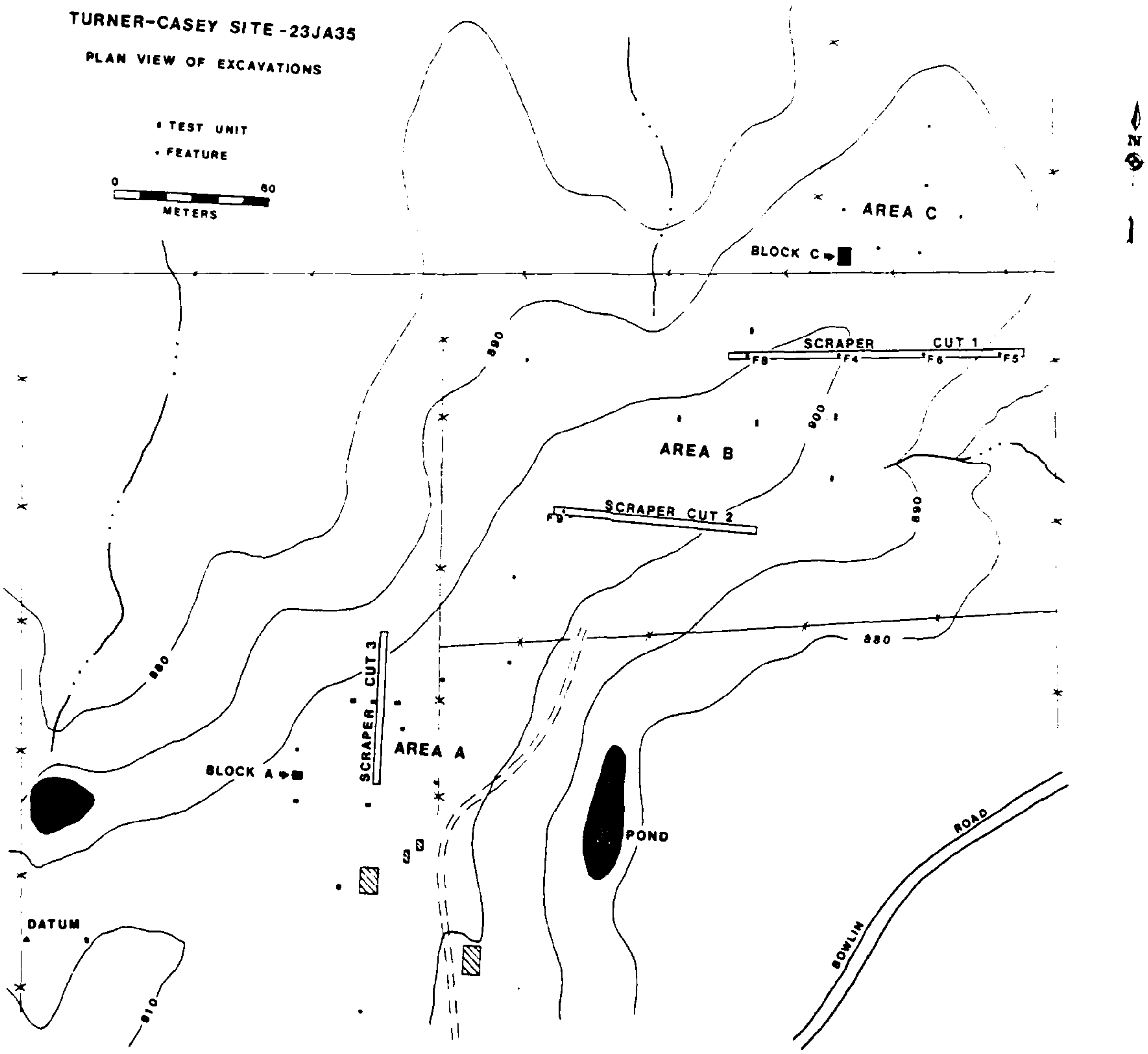
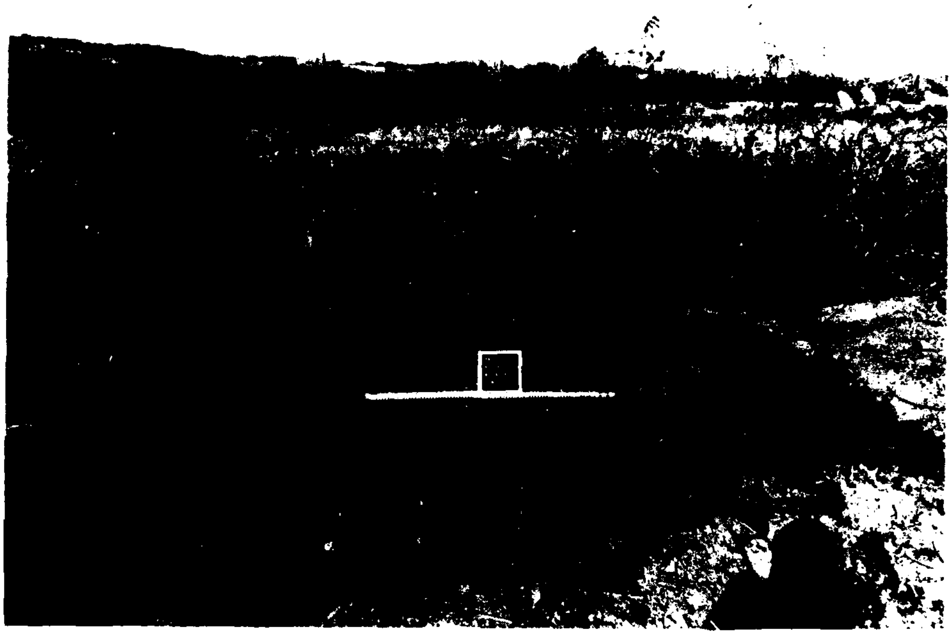


Figure 140. Plan view of excavations at the Turner-Casey site.



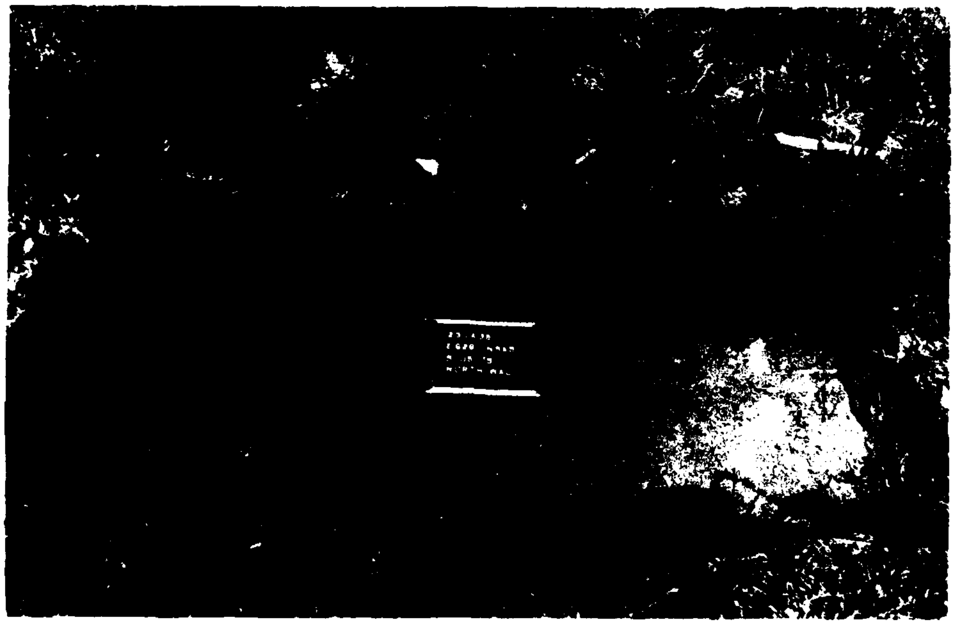


Figure 141. General views of excavations in Area A. Block A (upper) and Test Unit E628,N559 (lower).

In general, the results from Block A seemed to indicate the presence of a large concentration of lithic manufacturing debris located along this northwestern edge of the ridge crest. This material appeared to be badly disturbed, probably as a result of past agricultural activities and bioturbation. The stratigraphy in Area A consisted of an upper Alp soil horizon consisting of a dark brown (10YR3/3) weak granular silt loam from the surface to a depth of 20 cm (Fig. 142). A B1 horizon consisting of a brown (10YR5/3) coarse subangular blocky silty clay was present from 20-37 cm. A B2t horizon characterized by a dark yellowish brown (10YR4/4) coarse subangular blocky clayey silt was present below 37 cm. Cultural material was predominantly concentrated in the Alp horizon, although a fair amount was found in the upper few cm of the B1 horizon. Almost no material was present in the B2t horizon.

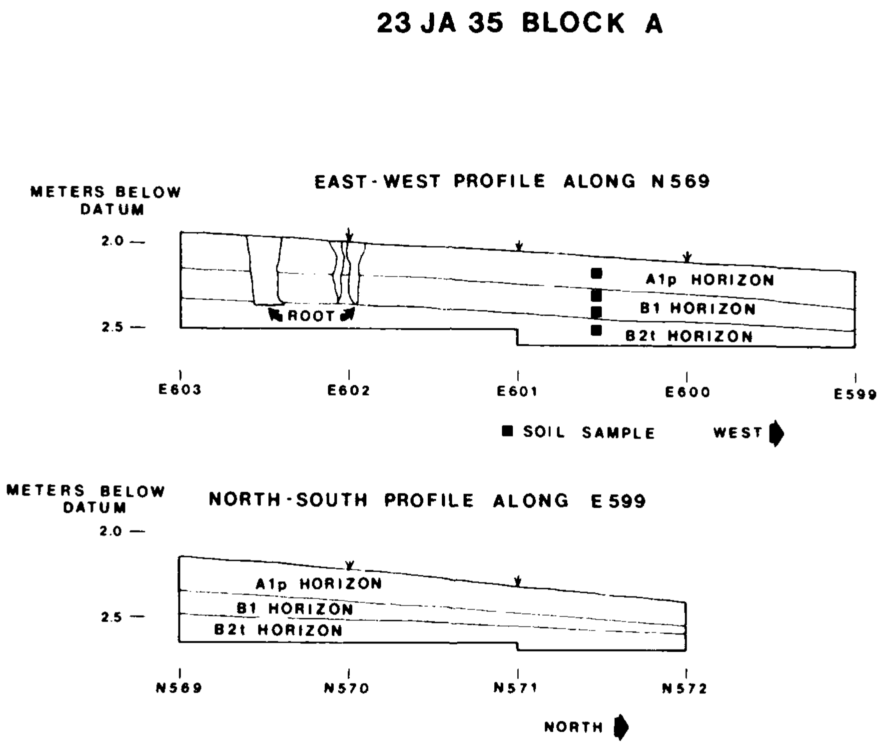


Figure 142. Soil profiles of Block A at 23JA35.

Since the investigations indicated that the cultural deposit in Area A was poorly preserved near the edge of the ridge crest, a second series of three test units were opened at 10 m intervals to the east along the E628 line. This second transect of test units was 25 m east of Block A and located on the level crest of the ridge. Coordinates of these test units were E628-629, N599; E628-629, N599; and E628, N599. A fourth unit (E630-631,

N569) was also opened between the first two units. A small amount of lithic material, concentrated in the upper 30 cm, was recovered from units E628-629, N599 and E630-631, N569. A higher concentration of lithic material was found in E628-629, N579 and in E628-629, N599. Cultural materials were present to a depth of 50 cm, but were concentrated in the upper 35 cm. Modern historic materials such as glass, nails and clay pigeons were frequent to a depth of 25 cm and in some cases occurred to a depth of 35 cm.

Six final test units were placed in Area A. Three of these (E654, N569; E650, N580; E639-640, N589) were located between the above four units and the fence to the east. These were placed along a south-southeast diagonal in order to sample this highest point of the ridge crest. Unit E654, N569 produced a moderate amount of material concentrated between the surface and a depth of 30 cm. Historic materials occurred to 20 cm. Unit E639-640, N589 produced a moderate concentration of material in the upper 30 cm. Modern historic materials were highly concentrated in this area.

An additional test unit in Area A was placed south of the house at E630, N479. This area was tested primarily to determine the southern extent of the concentration of lithics in Area A. This unit indicated a light amount of cultural material concentrated in the upper 30 cm but occurring to a depth of 55 cm. Historic materials occurred to a depth of 55 cm, indicating considerable disturbance. Two final Area A test units were placed in the northeastern part of Area A to the east of the fence that runs along the south border of the field comprising Area B. Unit E680, N617 produced a small amount of material in the upper 20 cm. Unit E655, N609 produced a light amount of material principally in the upper levels. The eastern margin of Area A is steeply sloped and appears to have been badly eroded.

At the close of the excavations at 23JA35, a scraper cut (Scraper Cut 3) was placed in Area A. This consisted of a north-south transect 60 m in length located along E630 and from N567 to N627. While a number of artifacts were recovered from the scraper cut, no features such as pits, hearths, or charcoal stains were found.

In summary, the excavations in Area A indicated the presence of a large concentrated scatter of cultural debris located on the summit and northwestern crest of the ridge. This material is most heavily concentrated on the northeast and northwest margin of the ridge crest between Block A and Scraper Cut 3. This concentration may extend to the northeast and be part of the scatter delineated in the southwest corner of Area B by Ziegler. While artifacts are highly concentrated in Area A, they have been badly disturbed. Cultivation of the area and historic dumping have resulted in the mixing of prehistoric Nebo Hill materials with modern artifacts.

According to Mike Casey, the area of the pasture (Area A) along the fence just north of the home and farm buildings was used as a garden over a long period of time. Dumping of ashes from trash fires and wood stoves on gardens was a common practice at many late 19th and early 20th century midwestern farmsteads. This practice may be one of the major factors contributing to the incorporation of large amounts of historic materials into the soil. The numerous clay pigeons alone indicates that the area was used frequently for skeet shooting.

No structural features were encountered in the hand excavations or in Scraper Cut 3 at Area A. It is likely that few features were preserved due to the shallow nature of the occupation. Many of these may have been destroyed by the historic occupation. Because of the high degree of disturbance in Area A, investigations were continued at other areas of the site which were less disturbed.

Area B

The 1979 investigation in Area B included seven test units and two mechanized scraper cuts (Fig. 140). The test units include four one by one m units and three one by two m units. Four test units were laid out along the crest of the ridge above the 900 ft contour lines, one was located in the northwest corner of the field, and two in the east central area of the field. Units E680, N650 and E700, N675 intersected the concentrated area of debris noted by Ziegler in the southwest corners of Area B. Both units produced a moderate amount of lithics, principally manufacturing debris concentrated in the upper 25 cm.

Four additional units were placed in the center of Area B; two along the crest of the ridge, and two along the east slope. The two units along the crest of this ridge (E740, N713-714 and E770, N713-714) produced a moderate amount of lithic debris concentrated in the upper 25 cm. Several flakes were found in one unit to a depth of 45 cm. The two units along the east slope (E800, N695 and E800, N718-719) produced additional lithics. The latter unit produced a high concentration, but in both units the cultural material was concentrated in the upper 20 cm. A final test pit in Area B was located along the crest of the ridge in the northeast corner of the field. Lithic debris was found to a depth of 50 cm but was concentrated in the upper 20 cm.

No evidence of charcoal, burnt clay, organics, or cultural features was recovered in any of the test units in Area B. The stratigraphy in Area B consisted of an upper dark brown (10YR3/3) silty clay (Alp horizon) overlying a dark yellowish brown (10YR4/4) silty clay with a coarse subangular blocky structure (B2t horizon). No evidence of the B1 horizon was found in Area B. In general, the soil profile appeared to consist of an organically enriched recent cultivation zone on a deflated B2t horizon. Since the cultural deposits in Area B were thin and disturbed, it was determined that extensive work in this area in the form of block excavations would not be productive. However, at the close of the excavations at 23JA35, two mechanized scraper cuts were placed in Area B (Fig. 140). Scraper Cut 1 consisted of an east-west transect 114 m in length located in the northeast Section of Area B. Scraper Cut 2 was 78 m east-west in the southwestern section of Area B (Fig. 140). Scraper Cut 1 produced a number of artifacts and several charcoal stains including the base of a small pit (Fig. 143). A number of artifacts and several stains which apparently were burnt roots were encountered in Scraper Cut 2. These features and stains are more fully discussed in subsequent sections.

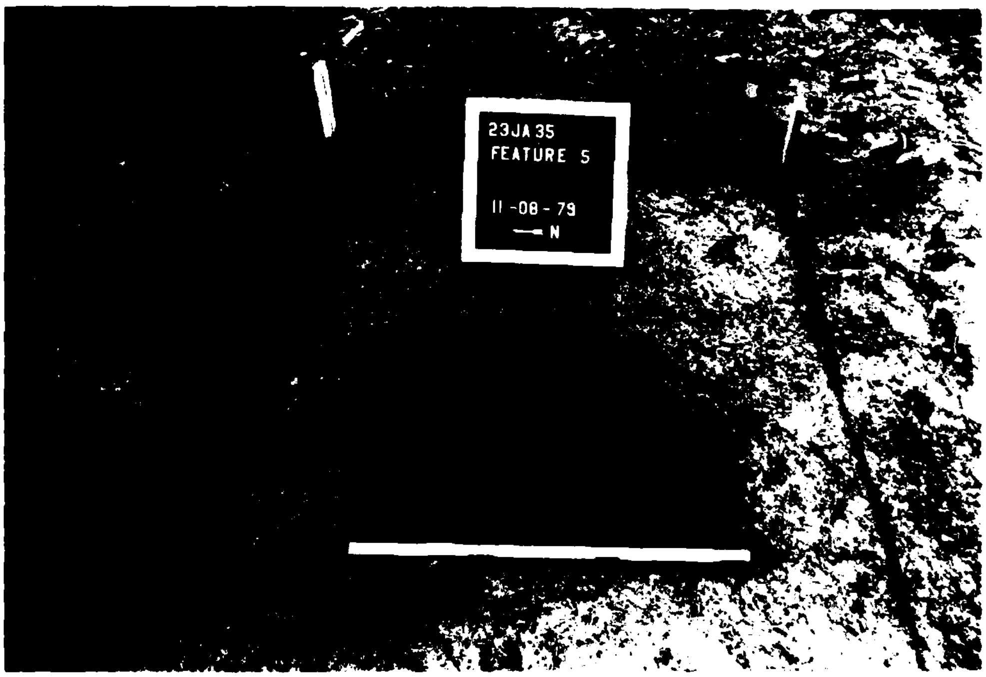


Figure 143. General view of mechanized scraper cuts and charcoal stains at 23JA35. View to the west of Scraper Cut 1 (upper). Charcoal stain (Feature 5) located in Scraper Cut 1 (lower).

Area C

Area C of the Turner-Casey site is located on the east of the ridge, directly north of Area B (Fig. 140). This portion of the site is presently in timber and, according to local informants, has not been cultivated. Area C of the site had not previously been tested. Casey reported finding numerous artifacts just to the south along the north fence of Area B. He also found a number of Nebo Hill points along the northeast margin of Area C just above the rock shelter at 23JA37.

Testing of Area C began with a transect of three test units laid out on the N785 grid line. The test pit to the west (E799-800, N784) produced a considerable amount of material, including diagnostic artifacts, to a depth of 50 cm. No modern artifacts were encountered. Unit E813, N785 produced a moderate amount of material to a depth of 40 cm. Several modern artifacts were encountered in this unit. Unit E829, N784 produced material to a depth of 45 cm with a concentration in the 25-35 cm level. One modern artifact was found in the upper 10 cm of this unit. Based on the results of these three units, the test pit to the west (E798-800, N784) was expanded into a block referred to as Block C (Fig. 144).

Concurrent with the excavation of Block C, four additional test units were opened along the ridge to the north. Test Unit E799, N799, located to the north of Block C contained a fair amount of material to a depth of 70 cm. Units E830, N810 and E830, N833 contained a light amount of material concentrated between 20 and 40 cm. Unit E844, N799 contained a moderate amount of material to a depth of 65 cm. These additional test units in Area C seemed to confirm the earlier results indicating that the most concentrated cultural deposits in Area C were located in its southwest corner near Block C. Consequently, further efforts in Area C were focused on the expansion of this block. By the close of excavations, Block C was expanded to a five by eight m area. General views of the excavations at Block C are presented in Figure 144.

Over 7000 artifacts were recovered from Block C, the majority of which were evenly distributed in the 0-15, 15-25 and 25-35 cm levels. A substantial number were also recovered in the 35-45 cm level. Less than 5 percent were found from 45-55 cm. While a substantial number of artifacts were recovered from Area C, no evidence of features was encountered. The matrix contained only occasional small flecks of charcoal. Relatively small amounts of modern historic artifacts were found in Area C. These were principally located in the upper 15-20 cm, although occasional historic artifacts were found to a depth of 30 cm, and one was found to a depth of 50 cm.

The stratigraphy in Area C (Fig. 145) consists of an A11 horizon characterized by a very dark gray (10YR3/3) silty loam with a granular structure from 0-24 cm. This is underlain by a A13 horizon. The A13 is a brown (10YR5/3) silt loam with a weak fine subangular blocky structure. The boundary between the A11 and the A13 is wavy. A B1 horizon is present from 36-48 cm and consisting of a dark yellowish-brown (10YR4/4) clayey silt with a moderate medium subangular block structure. At 48 cm there is a transition from the B1 to a B2t horizon. The boundaries of these soil horizons are generally parallel, although wavy and conforming to the slope of the surface.

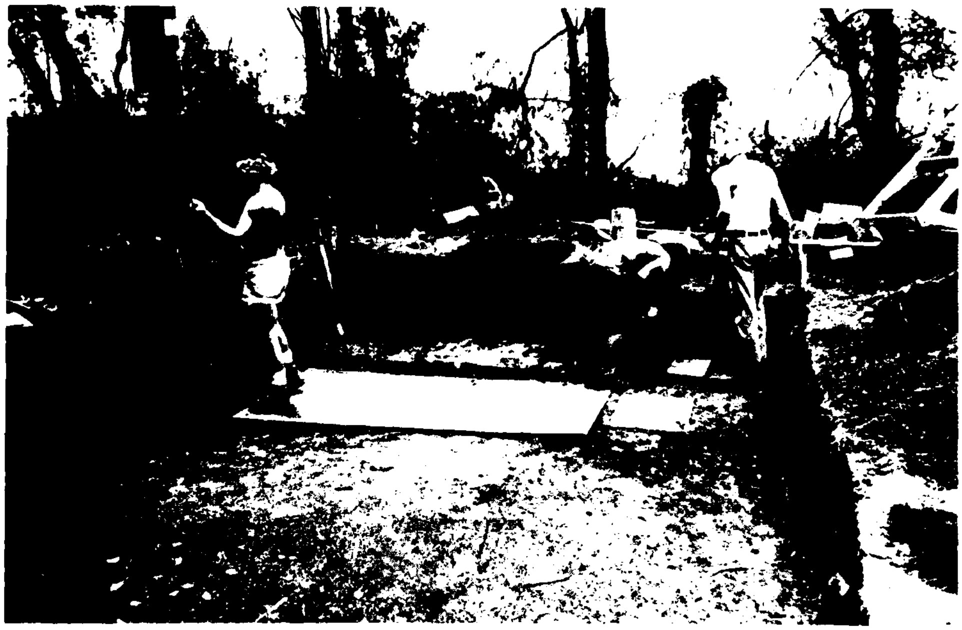


Figure 144. General views of the excavations at Block C. General view to the south of the excavation in progress (upper) and general view to the west of the completed excavations (lower).

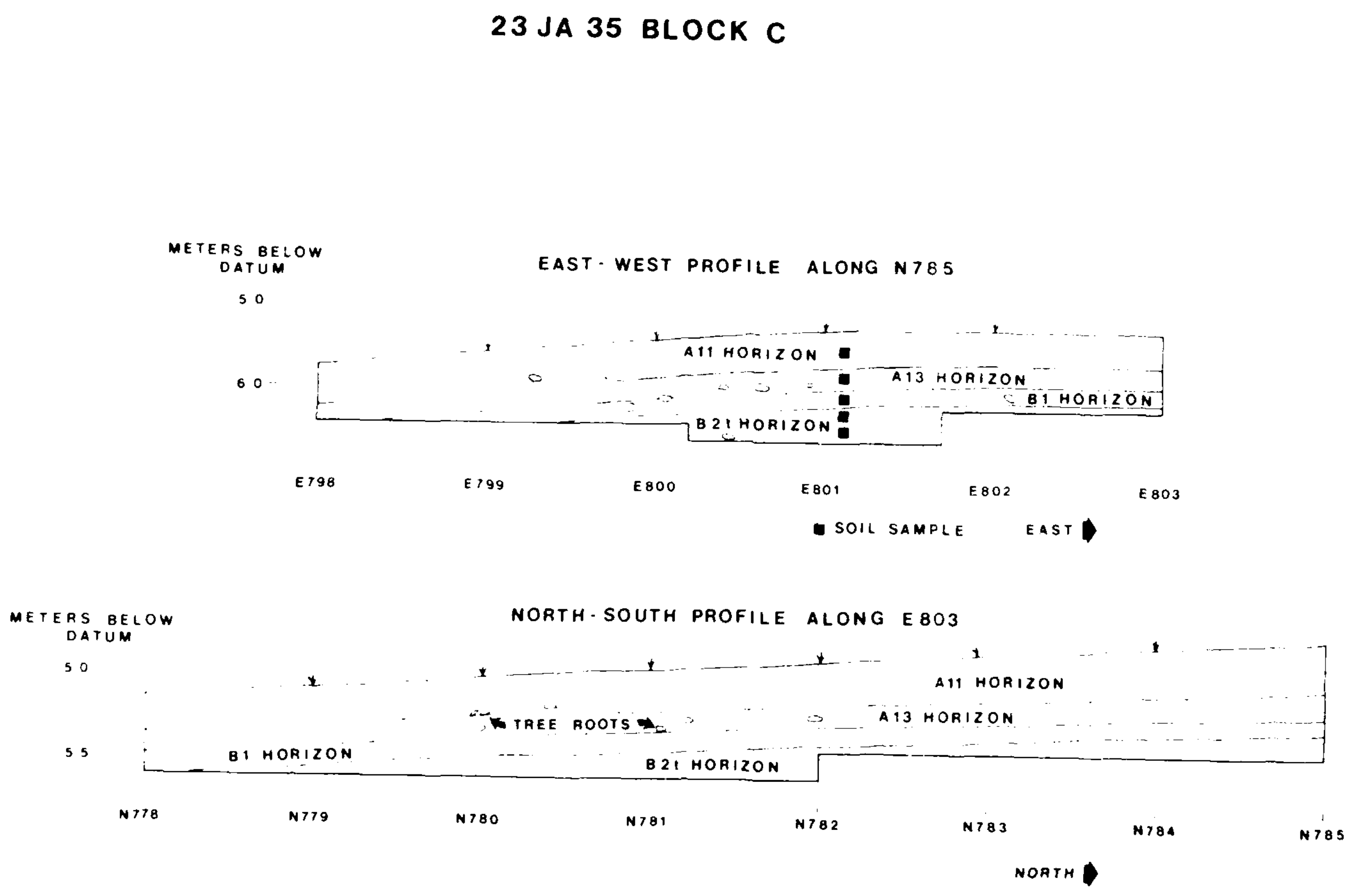


Figure 145. Soil profiles at Block C of 23JA35.

The B1 horizon does not pinch out as it does in Area A, indicating a greater degree of preservation of the original soil horizon. The cultural material in Area C is principally confined to the A11 and A13 horizons. A small amount is present in the B1 horizon and little or no material was recovered from the B2t horizon. In summary, excavations in Area C indicate that this area of the site contains an intact soil profile with the best preserved cultural deposits at the site. However, cultural debris in Area C is considerably less concentrated than in Area A.

Features

A total of seven cultural features and natural stains were recovered from 23JA35. These are referred to as Feature 1 and 4-9. Feature Numbers 2-4 were not assigned during the coarse of the field investigations. No features similar to the limestone rock hearths or ovens encountered by Casey and Wilson were recovered during the 1979 excavation. Due to the shallow depth of the site, few features of this type were probably preserved. In Area B, poor preservation would be compounded by disturbance resulting from cultivation. However, only a small portion of Area B was opened by the scraper cuts. It is likely that additional features such as pits or basin shaped hearths similar to Feature 6 (discussed below) are present on this site and would produce additional needed information regarding the site's chronology and settlement-subsistence patterns.

Feature 1: This feature consisted of a cluster of six flakes and one section of limonite. The feature was located in Area A test unit E640, N589 at a depth of 33-36 cm. The cluster extended over an oval area 6 by 13 cm.

Feature 4: This feature was a small circular charcoal stain located Scraper Cut 1. The stain was 17 cm in diameter and extended from 36-47 cm below the surface. No cultural material was recovered from the fill of the stain or was directly associated with it. Consequently, association of this feature with cultural activities at the site is questionable. The stain may well be a burnt tree root.

Feature 5: This feature was located in the east end of Scraper Cut 1 and consisted of a circular stain initially observed at a depth of 35 cm below the surface (Fig. 143). Grid coordinates of Feature 5 are E862, N752. The feature tapered to its base, extending to a depth of 70 cm. The upper 13 cm of the feature contained charcoal and burnt clay. Several flakes and a small red ocher stain were associated with the feature. However, the size and slope of the feature appeared to resemble more closely a tree root than a pit or hearth.

Three flakes were recovered from Feature 5. Waterscreening and flotation of the matrix of the feature (25 liters) recovered 21 (1.1 g) small pieces of burnt clay and one small piece of hematite (0.1 g). A large number of intrusive modern seeds were also recovered from the feature. Included are sunflower (*Helianthus annuus*), velvet leaf (*Abutilon theophrasti*), Johnson grass (*Sorghum halapense*), Japanese clover (*Lespedeza stipulacea*), smartweed (*Polygonum pennsylvanian*), foxtail (*Setaria* sp.), pigweed (*Amaranthus rudis*), and sticktight (*Desmodium* sp.).

Feature 6: Feature 6 is the only positively identified cultural feature recovered at the site. The feature consists of a shallow oval pit 84 cm by 75 cm. This pit had a depth of 22 cm but likely had been truncated by cultivation. It was located just below the plow zone in the B2t soil horizon at a depth of 20 cm. Feature fill consisted of a dark gray-black matrix containing charcoal, waste flakes, small flecks of burnt clay, carbonized seeds and nutshells, and intrusive modern uncarbonized seeds. A small rodent disturbance was found at the south edge of the feature.

Artifacts from the excavation of Feature 6 include 4 lumps of burnt clay, 3 small pieces of hematite, 2 small unidentifiable fragments of unworked bone and 6 chert flakes. Waterscreening and flotation of the matrix (152.5 liters) recovered an additional 31 (0.4 g) small bone chips, many of which were burnt black or white, 73 (5.3 g) small pieces of hematite 1-7 mm in diameter and 11 (1.9 g) lumps of burnt clay. Organic remains include 280 small fragments of carbonized nutshell and wood charcoal with a weight of 5.1 grams. Nut species present include hickory (Carya sp.), walnut (Juglans sp.), and acorn (Quercus sp.). A radiocarbon date of 4550±115 B.P. (Beta 1873) was obtained on the carbonized nutshell remains.

A large number of seeds was also present. The majority of the seeds were uncarbonized. Species present include pigweed (Amaranthus rudis), smartweed (Polygonum pennsylvanicum), sunflower (Helianthus annuus), croton (Croton monanthogynus), foxtail (Setaria sp.), Japanese clover (Lespedeza stipulacea), catchfly (Silene antirrhina), ragweed (Ambrosia artemsiifolia), and lambsquarters (Chenopodium sp.). A carbonized grape seed (Vitis sp.) was also present.

No hearthstones or quantities of burnt clay were associated with Feature 6. The feature probably represents a shallow pit rather than a basin-shaped hearth.

Feature 7: Feature 7 was located in Scraper Cut 2 and consisted of a circular stain 11 by 10 cm. The feature was encountered at a depth of 25 cm and extended to 73 cm below surface. A cross-section of this feature revealed an irregular profile indicative of a tree root.

Feature 8: Feature 8 was a burnt clay and charcoal stain first apparent at 25 cm below surface in Scraper Cut 1. The feature had a diameter of 33 by 29 cm and a vertical depth of 85 cm. Considerable charcoal and burnt clay were present in the first 25 cm, with diminishing amounts to 85 cm below surface. One flake was noted in the first 10 cm of this stain. The vertical extent of this feature and the presence of radiating stains indicate that it likely is a burnt tree root. Waterscreening of the contents of the feature recovered 16 (1.9 g) small pieces of burnt clay.

Feature 9: This feature was located in Scraper Cut 2 and consisted of stain 20 cm in diameter. The stain was noted at a depth of 36 cm and extended to a depth of greater than 90 cm below surface. The fill consisted of mottled gray brown silt with several small pieces of burnt clay and charcoal. This feature probably resulted from rodent activity.

RADIOCARBON DATE

The 5.1 g sample of carbonized nutshells and small charcoal flecks from Feature 6 was submitted to Beta Analytic, Inc., for radiocarbon dating. The sample was extremely small and was further reduced by cleaning and pretreatment. Because of its small size, the sample was given extended counting time. The date produced was 4550±115 B.P. or 2600 B.C. (Beta 1873).

The carbonized nutshells and charcoal from Feature 6 were not directly associated with diagnostic Nebo Hill artifacts. However, numerous Nebo Hill artifacts have been found on the slope in the northeast corner of Area B extending over the area where Feature 6 was located. The artifact assemblage from the site in general indicates the presence of a single component Nebo Hill occupation. These factors strongly support the association of Feature 6 with the Nebo Hill occupation of the site.

The radiocarbon date from 23JA35 is somewhat older than both the date of 3550±63 B.P. from the Nebo Hill site (Reid 1980) and the date of 2970±490 B.P. from the Sohn site (Reeder 1980). Nevertheless, the date falls well within the estimates of the chronological position of the Nebo Hill phase. The implications of this date and a further discussion of the chronological position of Nebo Hill phase sites are discussed in more detail in later sections of this report.

CERAMICS

Two ceramic body sherds with fiber temper were recovered from Areas A and B (Fig. 146). Table 71 presents a summary of descriptive data. Both specimens appear to be tempered with grass. One (specimen AB-C1) clearly exhibits seed impressions on its exterior surface. Specimen 2167 has at least one inclusion of indurated clay. Both sherds have one relatively flat surface with indications of light smoothing. This surface is presumably the exterior surface of the vessel. Both outer surfaces range from light yellowish brown to brownish yellow. Core color for Specimen AB-C1 is also brownish yellow indicating that it was well-fired. Specimen 2167 has a dark grayish brown core, indicating incomplete oxidation of carbonaceous matter. Other than light smoothing, the sherds do not show additional evidence of manufacturing technique or decoration. End fractures are rounded, probably by breakage and weathering.

Fiber tempered wares are the earliest ceramic vessels in North America recorded to date. Reid (1978) has reported fiber tempered body sherds from the Nebo Hill site which are contemporaneous with ceramics from a number of sites in southeastern United States. These indicate an early (ca. 1600 B.C.) westward extension of such a ceramic manufacturing tradition. Although it is suggested that the spread of vessels and/or knowledge of ceramic technology may have occurred via relationships with southeastern complexes, it is equally viable that the Nebo Hill ceramics represent an indigenous development (Reid 1978:187-188). An indigenous development of fiber tempered ceramics would be supported by the fact that Turner-Casey is dated as early as 2600

Table 71. Descriptive data for fiber tempered body sherds from 23JA35.

CATALOG NUMBER	PROVENIENCE	WEIGHT (g)	THICKNESS (mm)	MUNSELL COLOR Exterior	Core	Interior	Temper
AB-C1	Area A Cut 1	5.3	9.5	10YR6/6; brownish yellow	10YR6/6; brownish yellow	10YR6/4 light yellowish	grass & seed
2167	E640-83N589.00	7.6	9.5	10YR6/6 brownish yellow	10YR4/2 dark grayish brown	brownish yellow	grass

B.C., approximately 500-1000 years earlier than sites with fiber-tempered wares from Georgia-Florida and northeastern Louisiana (Ford and Webb 1956:62-6, Bullen 1961:105).

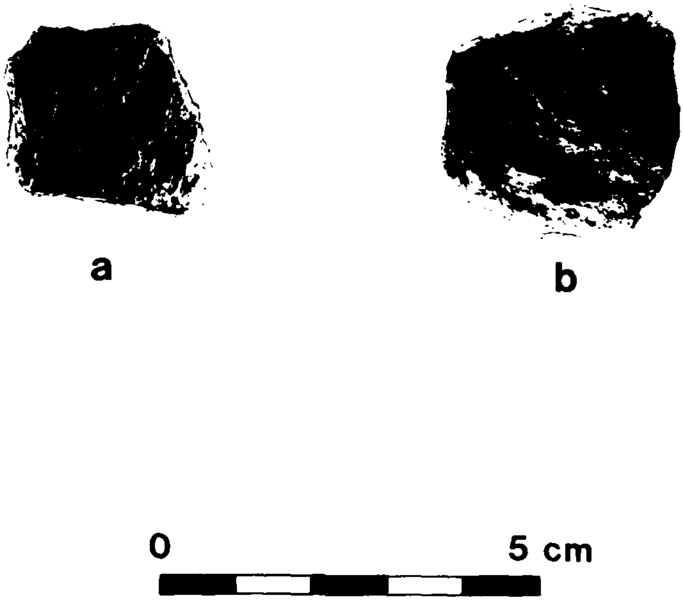


Figure 146. Fiber tempered ceramics from 23JA35.

LITHIC ASSEMBLAGE

The lithic assemblage consists of a series of chipped stone bifacial (n=102) and unifacial (n=326) tools, manufacturing debris (n=26,613), ground stone artifacts (n=26) and unworked stone (n=2096). The primary goal of this section is to describe and tabulate the assemblage.

The procurement and production strategies of the chipped stone industry, as demonstrated by the excavated samples, are discussed in subsequent sections. Since these interpretations are relevant to artifact production rather than tool usages, terminology and classification of artifacts will deviate from those presented in other chapters of this report. For example, tools and by-products are described by their technological and morphological attributes, rather than by functional terminologies. This analytical strategy provides replicable descriptions of the assemblage and a data base for study of the industry's logistics.

Chipped Stone Tools

Bifacial Tools

Bifacial tools are chipped stone artifacts which exhibit complete or almost complete removal of flakes from both faces of the chert. The lateral margins always exhibit areas of secondary flake removal. Although individual configurations will vary, this series of artifacts usually demonstrates a relatively high degree of symmetry. There are two major categories of bifacial tools: (1) light duty and (2) heavy duty. Frequently, tools are variously classified as "drills," "projectile points," "arrow heads," "dart points," "knives," "axes," and "diggers" prior to detailed analyses of wear patterns. Regardless of the typical form these artifacts resemble, it is probable that they served a variety of functions. The task to which an artifact is assigned is largely dependent on the motor abilities and wishes of the artisan/worker (Terray 1968). These considerations influence the terminology and inferences presented in the following descriptions.

Light duty bifacial tools

Points (n=65)

Points are the smallest category within the range of bifacially worked tools from 23JA35. They usually exhibit fine secondary retouch across all faces, a high degree of symmetry, no cortical surfaces, and at least one pair of distally convergent edges.

The points from 23JA35 include complete specimens, proximal, medial, and distal sections. Information gathered from the proximal (or basal) sections suggest similarities with the Type I-A lanceolate and elongate bifaces from Nebo Hill (Reid 1978). Cross sections are biconvex and mean width/thickness indices are comparable: $2.25 \pm .32$ mm (23JA35) vs. 2.05 ± 39 mm (Nebo Hill). Basal configurations are primarily straight. There is a small (n=2) index of subtriangular forms.

Continuous variables recorded for the points include length, width, thickness, basal width, stem length/width (when practical) and distal arc. Length was recorded to the nearest mm by sliding calipers along the longitudinal axis of the specimen. Width was measured along the transverse axis, and thickness was measured perpendicularly to both. Basal width was measured along the most proximal transverse axis (base) of the specimen. Stem width was taken along the specimen's transverse axis at the juncture of the blade and stem, if applicable. Stem length was measured perpendicular to stem width. The distal arc was recorded to the nearest degree on polar coordinate paper.

Discrete variables recorded included raw material type, edge shape, and basal configuration. Raw material types include Winterset, Westerville, or unidentified. Edge shape refers to biclinal or planoclinal configurations as described by Reid (1978). Basal configuration includes straight, convex, and concave forms.

The collection of points from 23JA35 has been subdivided into complete, proximal, medial, and distal categories. For each artifact category descriptive data is presented in tabular form. Additional tables are presented which summarize continuous discrete variables.

Complete points (n=8): This small collection consists of lanceolate (n=2), elongate (n=4) and subtriangular forms (n=2). The lanceolate specimens have slight proximal constrictions (stems) which might have served as haft elements. Their edge shapes are biclinal, and both have straight bases.Table 72 presents descriptive data for the complete points. Tables 73 and 74 summarize the metric and discrete characteristics of the sample.

The elongate specimens do not exhibit obvious stem preparations. Aside from this, three of them appear to be reworked versions of the complete lanceolates. Specimen 575 (Fig. 147 g) is a short, leaf-shaped point made from Winterset chert with a convex base that has been blunted and retouched forming a slightly rounded extremity. Its edge shape and width/thickness ratio are comparable to the other, longer specimens. Specimen 1810 (Fig. 174d) is made from a white unidentified chert and exhibits a pair of concave distally convergent edges rather than the usual convex configuration. This constriction is similar to working edges associated with drills or awls. As with the previous specimen, its edge shape and width/thickness index is similar to other longer specimens. Specimen 646 (Fig. 147e) is a short, straight-based Winterset point. In addition to being one of the smallest complete specimens, it is also the only specimen with a pair of planoclinal edges. Specimen 18 (Fig. 147n), also Winterset, is a thick leaf-shaped form with convex base. The distal portion is less finely retouched than the proximal area. As well, the tip contains a crystalline and calcitic inclusion. This flaw may have prevented additional edge refinement in this area. Its edge shape is biclinal.

The two subtriangular forms (Figs. 147f and 147i) bear little resemblance to each other. Specimen 571 is a short Winterset form with a concave basal configuration. Its width/thickness index is similar to other lanceolates, and its edge shape is biclinal for more than 75 percent of its total length, starting at the base. The edges then become steeply planoclinal to form its distal point. Given its width/thickness ratio and basal configuration, this point probably resembled the Nebo Hill lanceolate and elongate bifaces prior to breakage. The present subtriangular configuration is due to breakage and to post-breakage modifications. Apparently this tool was first broken along its transverse axis, then crudely retouched along that fracture. Specimen 10 (Fig. 147i) is the only complete form with pronounced stem preparation. The stem expands slightly toward its straight base and joins with a triangular blade. Although its edge shape is biclinal, its width/ratio is greater than the other complete specimens, giving it more of a flat lenticular cross-section.

Proximal sections (n=33): These basal fragments are straight (45.4 percent), concave (36.4 percent), or convex (18.2 percent). Edge shapes are biclinal (84.8 percent) and planoclinal (15.2 percent). Winterset chert is the dominant raw material (75 percent), while Westerville (12.1 percent) and unknown types (12.1 percent) account for the remainder (Tables 75 and 76).

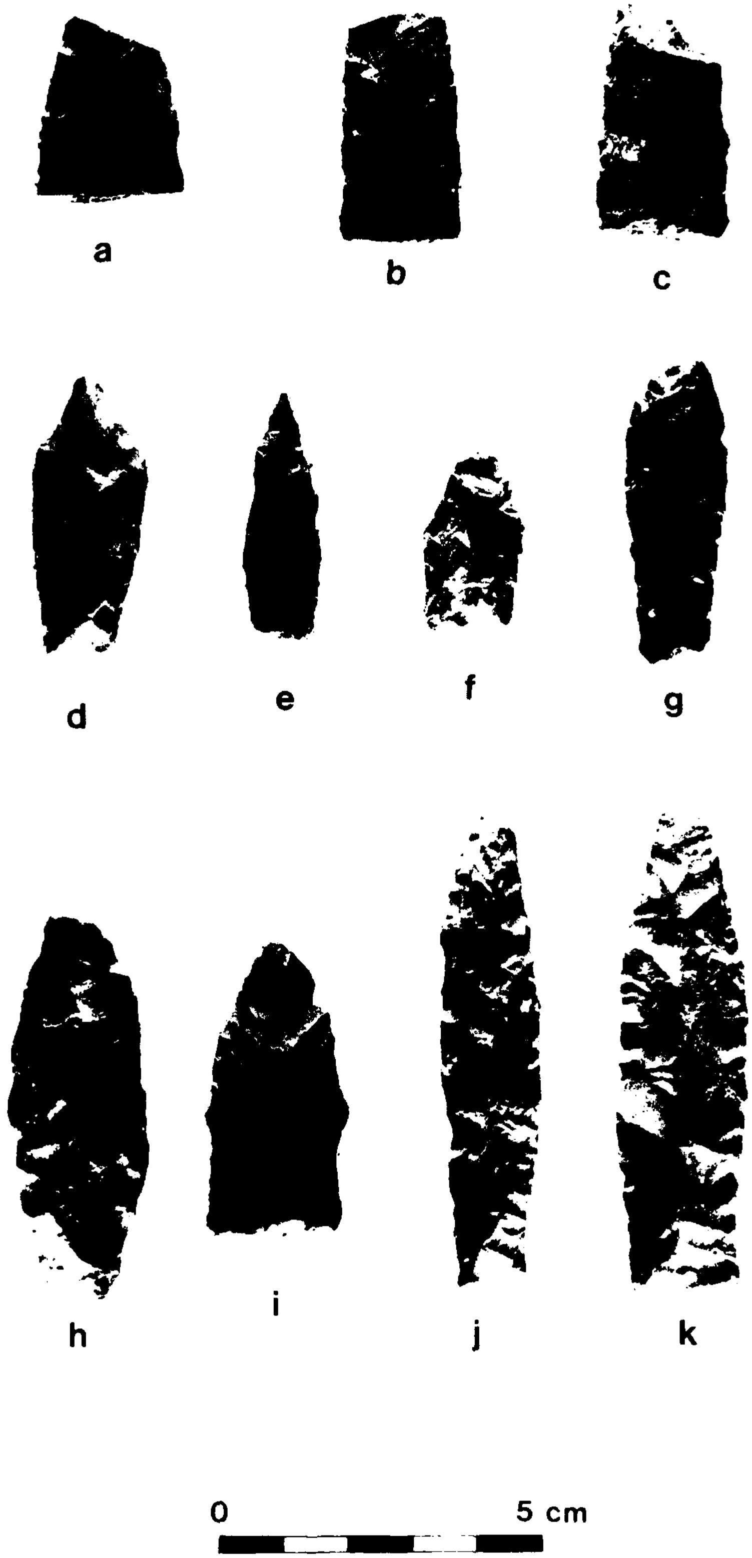


Figure 147. Medial point fragments and complete points from 23JA35.

Table 72. Descriptive data for complete points from 23JA35 .

CATALOG NUMBER	PROVENIENCE	DEPTH (bd)	MATERIAL TYPE*	EDGE SHAPE**	WEIGHT (g)	DIMENSIONS (millimeters) L	W	T	STEM WIDTH	STEM LENGTH	BASAL WIDTH	DISTAL ARC DEGREES
Area A												
761	E799N784	552	W-UNID	BC	15.5	77	20	10	17	18	17	22***
116	E628N579	173	WV	BC	10.5	75	16	9	11	15	10	20
575	E602N570	219	BWS	BC	6.7	48	17	7	NA	NA	10	24
646	E601N559	210-220	BWS	PC	3.6	38	13	8	NA	NA	9	18
571	E602N570	215	BWS	BC/PC	1.8	28	16	7	NA	NA	12	NA
Area C												
1810	E801N778	513	W-UNID	BC	6.2	45	18	9	NA	NA	9	15
Trench 3												
10			TWS	BC	7.7	46	22	9	19	16	21	22
18			BWS	BC	12.3	61	21	12	NA	NA	10	22

*BWS = Blue Winterset; TWS = Tan Winterset; WV = Westerville; W-UNID = White unidentified.
**BC = Biclinal; PC = Planoclinal.
***Estimated measure for this specimen.

Table 73. Summary of continuous variables for complete points.

	N	$\overline{X}$	s	Minimum	Maximum
WEIGHT (g)	8	8.03	4.53	1.8	15.5
LENGTH (mm)	8	52.25	17.35	28	82
WIDTH (mm)	8	17.75	3.05	13	22
THICKNESS (mm)	8	8.87	1.64	7	12
BASAL WIDTH (mm)	8	12.25	4.39	9	21
DISTAL ARC (degrees)	7	20.42	3.04	15	24

Table 74. Summary of discrete variables for complete points.

BASAL CONFIGURATION	
Straight	n=3 (42.85%)
Convex	n=2 (28.57%)
Concave	n=2 (28.57%)
RAW MATERIAL TYPE	
Winterset	n=4 (57.14%)
Westerville	n=1 (14.28%)
Unknown	n=2 (28.57%)
EDGE SHAPE	
Biclinal	n=6 (85.71%)
Planoclinal	n=1 (14.28%)

Table 75. Summary statistics of discrete variables for proximal point fragments.

BASAL CONFIGURATION	
Straight	n=15 (45.45%)
Convex	n=6 (18.18%)
Concave	n=12 (36.36%)
RAW MATERIAL TYPE	
Winterset	n=25 (75.75%)
Westerville	n=4 (12.12%)
Unknown	n=4 (12.12%)
EDGE SHAPE	
Biclinal	n=28 (84.84%)
Planoclinal	n=5 (15.15%)

Table 76. Summary statistics of continuous variables for proximal point fragments.

	N	$\overline{X}$	s	Minimum	Maximum
WEIGHT (g)	33	5.3	4.63	1.3	15.3
LENGTH (mm)	33	33.4	20.6	12	91
WIDTH (mm)	33	17.8	3.0	13	26
THICKNESS (mm)	33	8.06	1.73	6	13
BASAL WIDTH (mm)	32	12.9	2.43	9	19

Examination of the fracture planes present on these tools indicates that breakage was due primarily to impact rather than flaws inherent in the raw material. Only one specimen (750) shows evidence of "fatal" inclusions at this breakage point. The average width/thickness index of these fragments is 2.25±.32 which is comparable to that of the complete points (see above). The larger standard deviation is probably due to the increased sample size of this collection and, therefore, better estimates the tool's size range for that variable. In addition, the maximum length recorded fc. proximal fragments is 91 mm which is nine mm longer than the largest complete specimen (Table 72 and Table 77). Likewise, width and thickness are, respectively, four and one mm greater for the proximal fragments.

Lateral configurations of the proximal sections vary slightly. Two lanceolate specimens (486 and 836), (Fig. 148a and 148e) exhibit some proximal constrictions which may indicate stem preparation. Another possible subtriangular point (1169) (Fig. 1491) exhibits a side notch (Table 77).

Medial sections (n=10): Medial sections (point midsections) lack proximal and distal extremities. The midsections from 23JA35 are all characterized by two impact fracture planes. Edge shapes are biclinal. Raw material types are 40 percent Winterset, 40 percent Westerville and 20 percent unidentified.

Most of these specimens are similar to the midsections of the lanceolates seen in the collection of com...te tools from 23JA35 and in the collection of Type 1-A bifaces from the Nebo Hill site, 23CL11 (Reid 1978). The exceptions include Specimen 446, which has a width/thickness index of 3.28 (Fig. 147a); and specimen 314, a small medial fragment which resulted from a fracture very near the tip of the artifact. Tables 78 and 79 summarize metric and discrete characteristics of the medial point sections, and Table 80 provides detailed data.

Distal sections (n=14): Distal sections (or point tips) are sections with one transverse fracture plane and one pair of converging edges. Eleven of these (78 percent) exhibit smooth fracture planes; the remainder show flawed or noncherty inclusions which probably influenced the breakage pattern. The majority of these fragments are small (30 less than mm in length) tips with biclinal edges. Winterset chert accounts for nearly two-thirds of the raw material; Westerville, 21 percent. One large specimen (1226) (Fig. 149d) has a cross-section similar to the complete lanceolate specimens. Three other large specimens (33, 798 and 237) (Fig. 149 a-c) have width/thickness indices which indicate a slightly more lenticular cross-section when compared to lanceolates. The remaining specimens are insufficiently complete for comparative purposes. Tables 81, 82, and 83 present data on distal fragments.

Miscellaneous fragments (n=3): Two artifacts are medial segments of light duty bifacial tools with lateral configurations which deviate from the rest of the medial segments. The lateral edges constrict slightly above the base, assuming that the widest portion is proximal, to form a convex blade. A similar form is seen at Nebo Hill (23CL11). Reid (1978:95-6) suggests this form is a resharpened lanceolate point. The two from 23JA35 bear resemblances in cross-section to the site's complete specimens. Both fragments exhibit lateral edge crushing and smoothing indicating that they were used on hard materials su' as wood or stone. Both are also characterized by pot-lidded

Table 77. Descriptive data for proximal point fragments from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	STEM WIDTH (mm)	STEM LENGTH (mm)	BASAL WIDTH (mm)
Area A											
486	E601N571	238	TWS	BC	10.2	47	22	10	18	15	16
397	E600N571	235	WV	BC	3.7	30	18	8	NA	NA	14
393-2	E600N571	227-240	BWS	BC	1.5	14	15	6	NA	NA	12
659	E602N569	206-220	WV	BC	5.1	37	18	8	NA	NA	11
537	E602N569	221	TWS	BC	2.4	24	17	7	NA	NA	11
778	E600N569	220-230	BWS	BC	1.8	20	16	8	NA	NA	13
665	E602N569	211	BWS	BC	1.8	24	17	7	NA	NA	13
711	E599N571	238	BWS	BC	2.5	19	17	8	NA	NA	12
316	E599N560	220-230	BWS	BC	5.3	31	18	8	NA	NA	16
449	E601N569	221	T-UNID	BC	11.1	51	21	10	NA	NA	10
850	E600N559	175	BWS	PC	1.7	20	15	6	NA	NA	14
399	E600N571	237	BWS	BC	2.2	70	17	6	NA	NA	10
712	E599N571	740	BWS	BC	1.9	20	13	7	NA	NA	9
620	E600N559	180-190	W-UNID	BC	1.3	12	13	6	NA	NA	13
862	E600N569	220-230	BWS	PC	2.6	15	21	9	NA	NA	15
750	E600N571	245	BWS	BC	2.3	26	18	7	NA	NA	13
690	E600N570	220-230	BWS	BC	1.3	14	13	6	NA	NA	9
355	E601N559	100-190	BWS	BC	2.8	27	18	7	NA	NA	10
572	E602N570	218	BWS	BC	1.8	18	16	7	NA	NA	11
105	E629N599	234	BWS	BC	2.0	22	16	7	NA	NA	10
510	E600N579	239	BWS	BC	9.2	60	17	10	NA	NA	11
516	E599N570	230-240	WV	BC	6.1	42	18	7	NA	NA	12
Area C											
1037	E800N783	520-530	BWS	BC	4.4	24	21	8	NA	NA	16
766	E800N984	555	BWS	BC	2.1	18	14	8	NA	NA	12
1712	E800N780	510-520	BWS	BC	4.5	31	18	8	NA	NA	15
1426	E801N780	526	T-UNDI	BC	13.4	53	23	10	NA	NA	19
836	E700N675	195	T-UNDI	BC	10.8	88	18	10	14	25	15
1162	E798N782	551	TWS	BC	15.3	75	22	12	NA	NA	16
1169	E798N782	547	TWS	BC	2.2	21	19	6	NA	10	NA

(continued)

Table 77. (continued) Descriptive data for proximal point fragments from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	STEM WIDTH (mm)	STEM LENGTH (mm)	BASAL WIDTH (mm)
Trench 1											
8			BWS	PC	14.9	91	21	9	NA	NA	15
4			BWS	BC	17.1	49	26	13	NA	NA	14
28			WV	BC	3.2	25	16	8	NA	NA	12
Trench 3											
1			BWS	BC	5.6	37	17	9	NA	NA	11

*BWS = Blue Winterset; TWS = Tan Winterset; WV = Westerville; W-UNID = White unidentified; T-UNID = Tan unidentified.

**BC = Biclinal; PC = Planoclinal

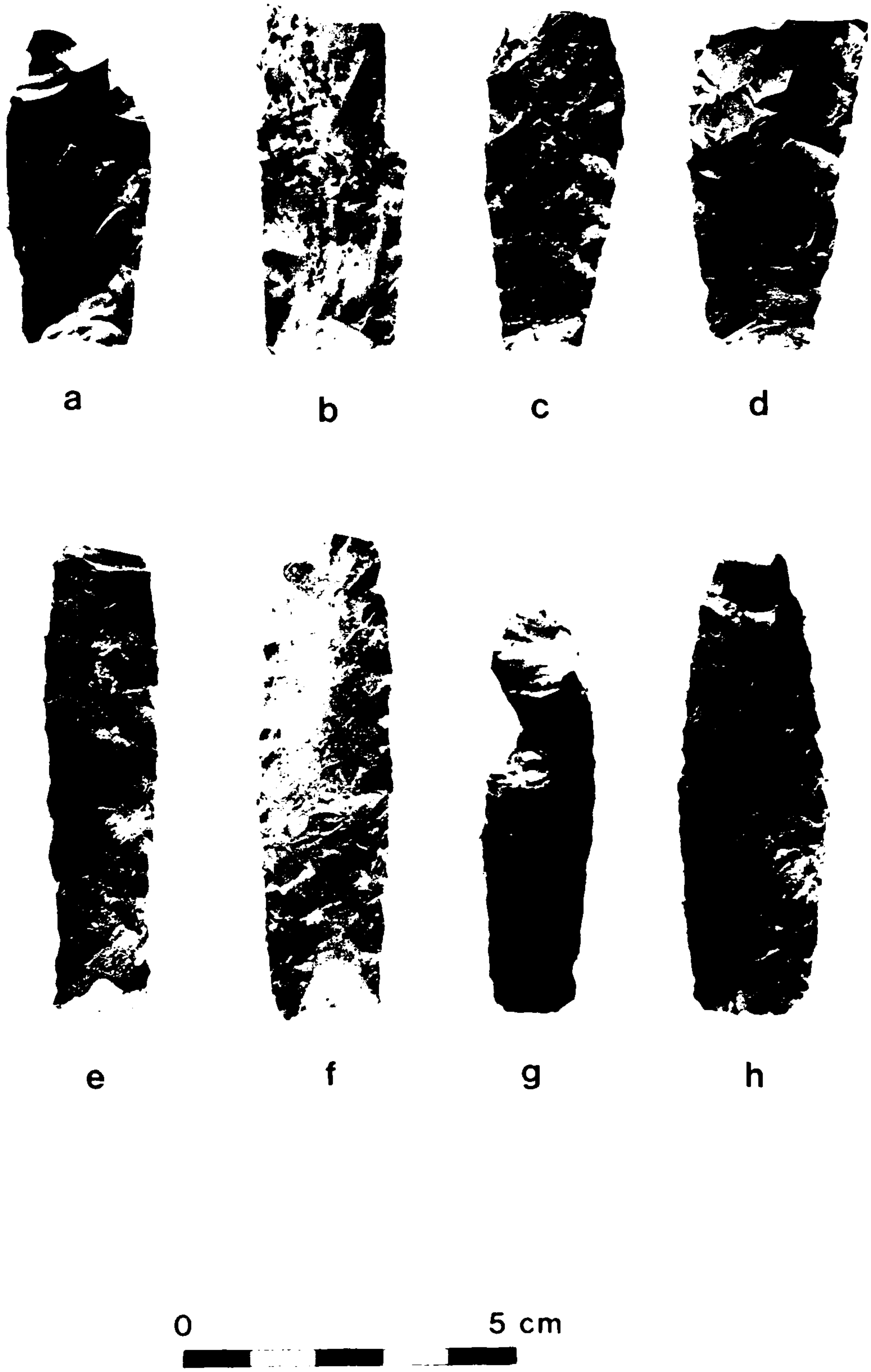


Figure 148. Proximal point fragments from 23JA35.

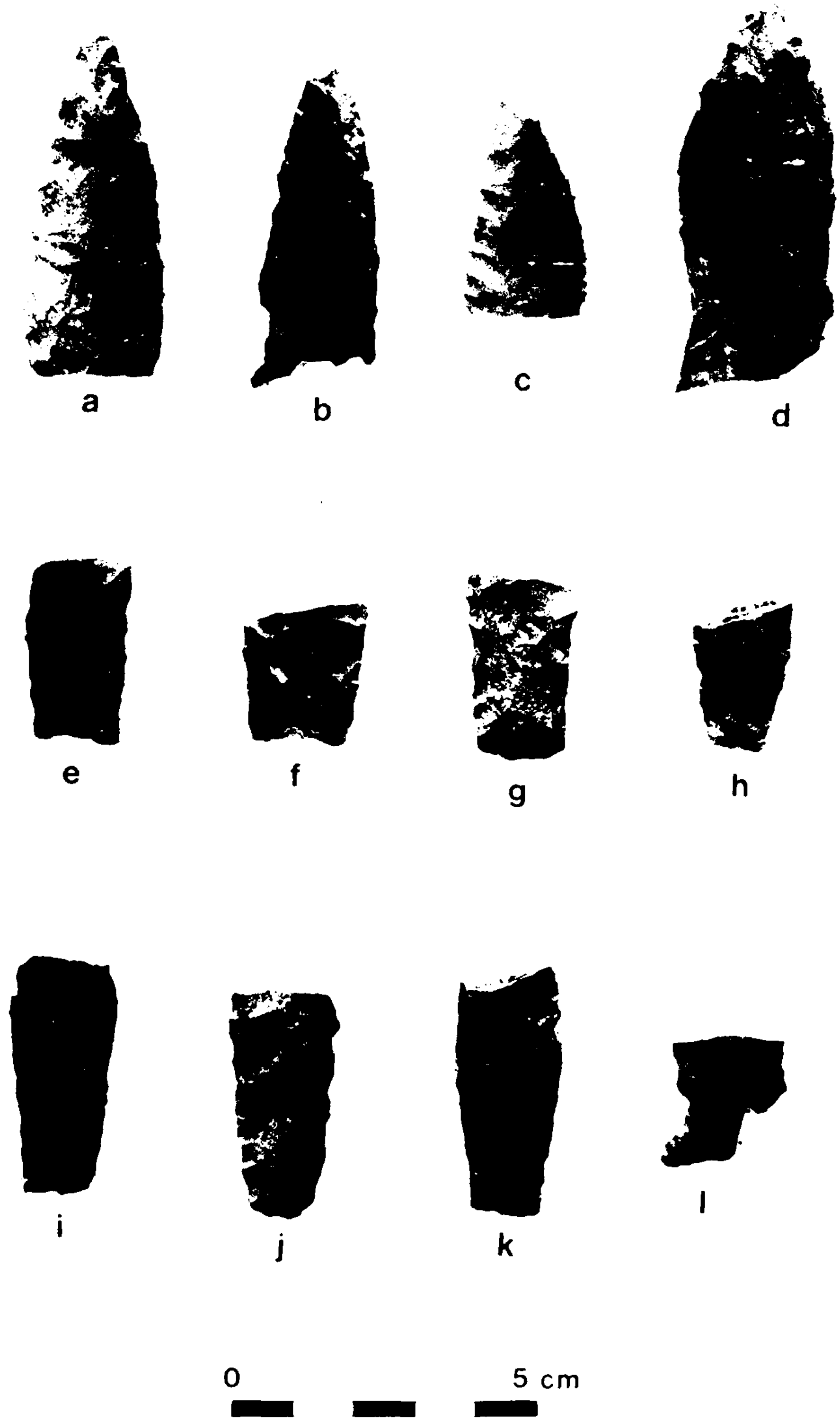


Figure 149. Distal point fragments from 23JA35.

Table 78. Summary statistics for continuous variables for medial point fragments.

	N	$\bar{X}$	s	Minimum	Maximum
WEIGHT (g)	10	5.65	2.96	.3	9.1
LENGTH (mm)	10	26.9	8.26	9	36
WIDTH (mm)	10	19.2	4.39	10	27
THICKNESS (mm)	10	9.1	2.28	4	12

Table 79. Summary statistics of distal variables for medial point fragments.

RAW MATERIAL TYPE		
	Winterset	n=4 (40%)
	Westerville	n=4 (40%)
	Unknowns	n=2 (20%)
EDGE SHAPE		
	Biclinal	n=10 (100%)
	Planoclinal	n=0 (0%)

Table 80. Description data for medial point fragments from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE**	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
Area A								
165	E620N599	183	WV	BC	3.1	22	16	10
446	E601N569	220-230	TWS	BC	4.7	30	23	7
393	E601N571	238	T-UNDI	BC	4.1	22	20	9
314	E599N569	220-230	BWS	BC	.3	9	10	4
Area C								
1690	E800N780	530-540	WV	BC	7.6	35	19	10
1441	E801N780	512	W-UNDI	BC	8.6	28	27	11
1923	E802N984	541	WV	BC	3.2	22	18	8
1563	E900N675	19[illegible]	BWS	BC	7.8	36	20	10
Trench 1								
19			WV	BC	8.0	33	20	10
15			BWS	BC	9.1	32	19	12

* BWS = Blue Winterset; TWS = Tan Winterset; WV = Westerville; W-UNDI = white unidentified; T = tan unidentified.
**BC = Biclinal; PC = Plano clinal.

Table 81. Summary statistics of continuous variables for distal point fragments from 23JA35 .

	N	$\overline{X}$	s	Minimum	Maximum
WEIGHT (g)	13	5.70	6.12	.7	20.5
LENGTH (mm)	13	31.46	17.23	11	66
WIDTH (mm)	13	17.84	4.56	12	26
THICKNESS (mm)	13	7.53	2.66	4	13
DISTAL ARC (degrees)	11	26.45	7.65	16	40

Table 82. Summary statistics of discrete variables for distal point fragments .

<u>RAW MATERIAL TYPE</u>

	Winterset	n=7 (53.84%)
	Westerville	n=2 (15.38%)
	Unknown	n=4 (30.07%)

<u>EDGE SHAPE</u>

	Biclinal	n=11 (84.61%)
	Planoclinal	n=2 (15.38%)

Table 83. Descriptive data for distal point fragments from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	DISTAL ARC (degrees)
Area A									
517	E599N570	230-240	BWS	BC	1.0	23	12	5	30
588	E549N570	225-230	BWS	BC	1.8	19	17	8	36
598	E600N570	Surf.	T-UNIL	BC	1.3	28	12	6	20
739	E600N559	180-190	BWS	BC	3.3	10	8	2	16
435	E602N469	240-250	BWS	BC	3.0	18	24	9	40
2307	E600N571	250-260	W-UNID	BC	9.7	57	22	8	20
339	E602N571	235	WV	BC	13.3	28	15	6	28
419	E601N469	210-220	BWS	BC	.9	11	15	5	NA
Area C									
1226	E79oN781	522	WV	BC	11.3	53	19	13	25
1732	E802N778	440-500	T-UNID	PC	.7	12	13	4	NA
1427	E801N780	530	BWS	BC	3.1	28	20	8	18
798	E800N784	515-530	T-UNID	BC	4.3	35	21	6	26
1336	E800N781	530-540	WV	BC	9.8	56	28	13	NA
Trench 1									
33			BWS	BC	20.5	66	26	12	32

*BWS = Blue Winterset; TWS = Tan Winterset; WV = Westerville; W-UNDI = White unidentified; T-UNDI = Tan unidentified.

**BC = Biclinal; PC = Plano clinal.

proximal fractures indicating thermal breakage, and smooth distal fracture resulting from impact fracture.

A third fragment is a proximal segment of an unstemmed point. It is included among the miscellaneous fragments since the specimen is straight-based with parallel lateral edges. It is thin, yet relatively wide it is suggested that this tool was more fragile than the other light duty tools, given the high width/thickness index (5.25).

Heavy-Duty Bifacial Tools

This series of artifacts consists of relatively large bifacially flaked tools with distally convergent lateral edges. Most of the cortex has been removed from both faces of the artifact and lateral margins always exhibit some areas of secondary retouch. They usually lack the symmetry of points and the consistent juxtaposition of "tips" vs. "bases." Heavy duty bifacial tools are generally more robust. In addition to being larger tools they also have greater width/thickness ratio. Tables 84-89 present data on heavy duty bi facial tools.

Continuous variables measured for this category include length, width, thickness, and weight. Discrete variables include edge shape, raw material, and fracture condition. These tools were subdivided into complete, distal, and medial categories.

Complete specimens (n=9): Complete heavy-duty tools vary in configuration, gross size and degree of workmanship. Included are ovate, subtriangular and leaf-shaped configurations (Figs. 150 and 151). Each specimen exhibits at least one lateral edge with secondary retouch and a uniform biclinal edge-shape. In some cases (Specimens 17, 2079, 132, 1) this condition extends along the entire perimeter of the artifact. One specimen (1026) exhibits conspicuous edge and facial polishing at one distal extremity. The remainder show lateral edge smoothing and crushing. Each of the complete tools was made from Winterset chert. Five show cortical surface on one or more faces (Table 84).

Distal sections (n=21): Distal sections are fragments which exhibit one transverse breakage plane (Fig. 151). Since this series of artifacts does not exhibit consistent orientation of tips or bases, they were not formally sub-divided into distal and proximal categories.

All distal heavy biface sections were made of Winterset chert and 15 (71.4 percent) have cortical surfaces. The edge shapes are primarily biclinal (71.4 percent). Fracture planes are almost equally smooth (47.6 percent) or flawed by non-cherty inclusions (52.4 percent). Only two distal fragments have evidence of extensive use. These specimens (814 and 31) (Fig. 151a-b) exhibit edge and facial polishing and have similar configurations and dimensions (Table 86). Both fracture planes show raw material flaws. These two tools may have been extensively used prior to breakage resulting from raw material inconsistencies. Tables 87 and 88 summarize discrete and metric characteristics.

Table 84. Descriptive data for complete heavy-duty bifacial tools from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH (bd)	MATERIAL TYPE*	EDGE SHAPE	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
Area A								
736	E600N579	115	BWS	BC	199	110	62	33
132	E631N560	170	BWS	BC	100.7	120	46	20
1026	E799N783	550	TWS	BC	111.6	111	48	25
2079	E770N714	337	BWS	BC/PC	32	82	33	13
Trench 1								
17			BWS	BC	40.3	76	38	14
3			BWS	PC	7015	116	35	23
Trench 3								
16			BWS	BC/PC	55.8	75	48	14
2			BWS	BC	66.6	93	41	12
1			TWS	BC	96.1	93	48	23

*BWS = Blue Winterset; TWS = Tan Winterset
**BC = Biclinal; PC = Planoclinal

Medial portions (n=4): Medial fragments consist of those large bifacial tools with two transverse fracture planes (Table 89). All of the fragments are made of Winterset chert. Most of the fracture planes are smooth, unflawed surfaces. The one exception to this is Specimen 1518, which has raw material inconsistencies on both fracture surfaces. The width, is within the range of variation for the heavy duty bifacial tools (Tables 84 and 86).

Table 85. Summary data for complete heavy-duty bifacial tools from 23JA35.

	N	$\overline{X}$	s	Minimum	Maximum
WEIGHT (g)	9	86.4	49.6	37	199
LENGTH (mm)	9	97.3	17.4	75	120
WIDTH (mm)	9	44.3	8.8	33	62
THICKNESS (mm)	9	19.6	7.03	12	33

Unifacial Tools

Unifacial tools consist of a collection of edge-modified flakes with marginally restricted edge damage or intentional retouch. Although modification occur on both faces, it does not manifest itself as directly-opposed, invasive flake removal. The collection is 95 percent Winterset chert; seven tools are probably tan Westerville. Tables 90 and 91 present descriptive data for unifacial tools.

Continuous and discrete variables were recorded for each flake. Maximum length is the largest dimension of the artifact in any plane. Maximum width is the largest dimension perpendicular to length. Maximum thickness is the largest dimension orthogonal to length and width. All were measured to the nearest mm with sliding calipers. Weight was recorded to the nearest 0.1 g. An index of robustness "I.R." was calculated from the width and thickness measurements: thickness/width x 100 = I.R. This measurement is useful for comparing the relative proportions of a sample of artifacts. For example, an increase in the I.R. indicates a thicker tool and, hence, an increase in tensile limitations and durability.

Discrete variables recorded include the presence of cortex, edge shape, tool condition, edge wear pattern, and raw material. Edge shape refers to the

Table 86. Descriptive data for heavy-duty bifacial tool distal sections.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE**	FRACTURE CONDITION**	WEIGHT	DIMENSIONS (mm) Length	Width	Thickness
637	E599,N570	228	BWS	BC	F	22.1	58	29	15
1025	E799,N783	551	BWS	BC	F	19.4	48	38	12
514	E599,N570	230-240	BWS	BC	S	8.7	28	29	15
543	E601,N559	165-170	BWS	BC	F	12.0	40	36	13
825	E601,N571	229	BWS	BC	F	30.0	60	31	15
2174	E640,N589	209	BWS	BC	F	12.6	36	33	15
591	E599,N570	228	BWS	BC	S	37.7	73	33	18
898	E801,N783	538	BWS	BC	F	20.3	41	34	15
1703	E800,N780	527	BWS	PC/BC	F	45.6	72	38	16
1824	E801,N778	509	BWS	PC/BC	S	60.7	67	42	20
1691	E800,N778	533	BWS	PC/BC	F	81.0	83	53	25
1032	E799,N783	549	BWS	BC	F	70.0	70	49	22
415	E601,N571	243	BWS	BC	S	26.7	42	39	16
2040	E654,N569	209	BWS	BC	S	10.5	31	35	14
Trench 1									
5			BWS	BC	S	11.6	30	36	13
16			BWS	PC	S	25.1	55	44	15
20			BWS	BC	S	17.0	35	31	12
23			BWS	BC	S	39.8	51	51	15
9			BWS	BC	F	32.5	36	45	22
22			BWS	PC	S	30.2	54	31	13
31			BWS	PC	F	25.1	76	39	16

*BWS = Blue Winterset
**BC = Biclinal; PC = Planoclinal
***F = Flawed; S = Smooth

Table 87. Summary statistics of continuous variables for heavy-duty biface distal sections.

	N	$\overline{X}$	S	Minimum	Maximum
Weight (g)	21	30.3	19.80	8.7	81
Length (mm)	21	51.71	16.91	28	83
Width (mm)	21	37.90	7.10	29	53
Thickness (mm)	21	16.0	3.48	12	25

Table 88. Summary statistics of discrete variables for heavy-duty biface distal sections.

RAW MATERIAL TYPE	
Winterset	N = 21 (100%)
EDGE SHAPE	
Biclinal	n = 15 (71.43%)
Planoclinal	n = 3 (14.28%)
Planoclinal/Biclinal	n = 3 (14.28%)
FRACTURE CONDITION	
Smooth	n = 10 (47.61%)
Flawed	n = 11 (52.38%)

Table 89. Descriptive data for biface tool fragments medial sections.

CATALOG NUMBER	PROVENIENCE	DEPTH	MATERIAL TYPE*	EDGE SHAPE**	FRACTURE CONDITION	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
1618	E799,N780	510-520	BWS	BC	S	17.9	30	35	18
511	E600,N579	276	BWS	BC	S	28.3	31	41	19
671	E602,N569	216	BWS	BC/PC	S	56.2	68	40	24
1518	E801,N781	531	BWS	BC	F	61.1		34	15

*BWS = Blue Winterset
**BC = Biclinal; PC = Planoclinal
***F = Flawed; S = Smooth

Figure 150. Complete heavy-duty bifacial tools from 23JA35.

Figure 151. Distal fragments and complete heavy duty bifacial tools from 23JA35.

Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
Page 1

CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
Area A											
638	E599N569	217	BWS		1A,S		15.4	47	40	10	25
636	E599N569	219	BWS		2A,S		.6	16	13	3	23
313-1	E599N569	220-230	BWS	+	1S		6.5	37	32	8	25
313-2	E599N569	220-230	BWS	+	1A,P		2.6	29	25	6	24
313-3	E599N569	220-230	BWS		1A,S	1A	2.2	27	25	3	12
313-4	E599N569	220-230	BWS	+		1S	13.9	58	23	11	47
319	E599N569	221	BWS	+	1A		5.4	41	21	6	28
321	E599N569	226	BWS	+	1S		5.6	35	27	6	22
317	E599N569	227	BWS		1P		36.1	82	32	12	37
318	E599N569	229	BWS		1A		7.9	35	30	8	26
320	E599N569	229	BWS		1S		2.9	38	21	4	19
371	E599N569	231	BWS		1A		16.4	46	32	11	343
707	E599N571	232-240	BWS	+	1P		2.1	25	18	6	33
676	E599N571	240-248	BWS		1A		3.3	30	12	7	33
678	E599N571	240-248	BWS		1S		.6	22	13	3	23
679-1	E599N571	240-248	BWS		1A		6.4	34	22	10	45
679-3	E599N571	240-248	BWS	+	1A,S		34.9	58	41	22	53
685	E599N571	241	BWS	+	1S		5.9	41	27	5	18
687	E599N571	241	BWS	+	1A		6.1	32	23	11	47
686	E599N571	243	BWS	+	1A	1A	41.9	70	40	21	52
849-1	E600N559	170-180	BWS			1S	19.9	56	30	11	36
849-3	E600N599	170-180	BWS		1A,S		4.3	35	28	4	14
619-1	E600N559	180-190	BWS			1S	4.8	28	19	9	47
621	E600N559	180-190	BWS	+		1A,S	3.2	33	22	6	27
623	E600N559	183	BWS		1A		.7	22	15	3	2
624	E600N559	184	BWS	+	1S		28.3	58	33	15	45

(continued)

Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	Length (mm)	Width (mm)	Thickness (mm)	I.R.
730-1	E600N569	212-220	BWS		1S		4.3	36	29	4	13
730-2	E600N569	212-220	BWS		1A		2.0	25	22	4	18
735	E600N569	218	BWS		1S		2.1	26	23	4	17
774-1	E600N569	220-230	BWS	+	1S		27.8	46	35	17	48
774-2	E600B569	220-230	BWS		1S,A,R		12.1	43	42	8	19
774-4	E600N569	220-230	BWS		1S,A		.7	19	13	4	30
771	E600N569	220-230	BWS		1S,A		5.9	31	20	9	45
782	E600N569	222	BWS			1A	14.9	51	41	12	29
785	E600N569	224	BWS		1A		2.0	36	17	4	23
863	E600N569	235	BWS	+		1A	8.3	48	23	9	39
398	E600N571	237	BWS	+	2A		8.4	29	22	13	59
742-1	E600N571	240-250	BWS		1A		3.5	31	24	5	20
503	E600N579	270-280	BWS		1P		2.5	27	21	7	33
509	E600N579	273	BWS		1S		6.3	34	30	7	23
719	E600N579	280-290	WV	+		1A	2.3	38	13	4	80
716-1	E600N579	280-290	BWS	+	1S	1S	15.3	68	24	9	16
724	E600579	281	BWS		1S,R	1S,R	17.7	55	35	10	28
544	E601N559	165-170	BWS		1A		1.0	23	16	5	31
352-1	E601N559	180-190	BWS	+	1A	1A	22.7	61	45	13	28
644	E601N559	190-200	BWS			1S,A	7.7	41	21	9	42
417-1	E601N569	210-220	BWS	+	1A		12.0	44	27	11	40
417-2	E601N569	210-220	BWS		1A		1.4	22	18	4	22
448-1	E601N569	220-230	BWS		1S		45.6	60	45	23	51
448-2	E601N569	220-230	BWS				4.2	37	20	6	30
483-1	E601N571	230-240	BWS				1.5	26	11	5	45
483-2	E601N571	230-240	BWS	+		1S	6.4	38	22	10	45

(continued)

Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
487	E601N571	233	BWS		1A	1A	11.9	49	33	10	30
360	E501N571	240	BWS	+	1S		43.1	58	38	23	60
414	E601N571	245	BWS		1A		17.3	55	40	16	40
660	E602N569	206-220	WV	+	1S		12.9	54	28	9	32
651-1	E602N569	206-220	BWS	+		1S,A	6.1	40	32	7	21
652-1	E602N569	206-220	BWS	+		1S,R	5.6	44	20	7	35
655-1	E602N569	206-220	BWS	+		1S	1.1	21	21	7	33
655-2	E602N569	206-220	BWS		1S,A		2.1	24	15	3	20
666	E602N569	217	BWS	+	1P,A,S	2S	10.3	43	30	10	33
669	E602N569	218	WV	+	1A		11.8	46	45	8	17
565	E602N570	216	BWS		1A		1.0	20	19	3	15
576	E602N570	219	BWS	+	1P		5.9	61	13	9	69
695	E602N571	220-230	TWS		1S		5.3	32	24	8	33
692	E602N571	220-230	BWS		1S,A		11.2	44	28	13	46
701	E602N571	225	BWS		1A,S		8.6	39	37	8	21
338	E602N571	237	BWS	+	1A		13.5	46	35	10	40
341	E602N571	238	BWS	+	1A		13.1	48	27	27	44
152	E629N579	175	BWS			1A	15.7	50	38	11	28
233	E628N579	128-140	BWS	+	1A		12.9	44	36	11	30
289-1	E628N599	226-230	BWS		1A	1S	2.2	26	21	4	19
162	E628N599	242	BWS		1A		6.6	39	25	6	24
163	E628N599	249	BWS		1A		5.4	56	35	11	31
133	E629N559	150-160	BWS		1A		2.6	38	21	4	19
198	E629N579	157-160	BWS		1S		3.3	26	23	7	30
199	E629N579	157-160	BWS		1S		3.2	26	14	10	71
1054	E630N569	186	BWS		2A,1P		6.2	49	18	8	44
166	E631N569	183	BWS	+	1A		31.8	57	41	14	34

(continued)

Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
125	E640N589	184	BWS	+	1S,R		10.5	39	30	9	30
248	E650N580	189	BWS	+	2A,S		27.2	51	30	8	26
304	E650N580	190-200	BWS		1A,2P		13.9	54	27	10	37
2128	E654N569	170-180	BWS		1A,S	1A	7.0	42	24	9	37
2153-1	E655N609	190-200	BWS		1A,P		1.0	23	15	5	33
2153-2	E655N609	190-200	BWS	+	1A,S		3.9	27	20	9	45
844-2	E600N559	170-180	BWS		1A,P		2.5	29	25	4	16
844-3	E600N559	170-180	BWS		1S,P		3.1	39	20	4	20
723	E600N579	280-290	BWS		1R,S	1A,S	4.6	37	24	5	20
667	E602N569	214	BWS	+	2S,1P		10.1	45	38	12	31
323	E599N569	225	BWS	+	1R,A,P		37.9	64	45	16	35
741	E600N571	240-250	BWS		1A		1.5	25	14	5	35
769-2	E600N569	220-230	BWS	+	1P,A		6.0	44	27	11	40
769-3	E600N569	220-230	BWS	+	1		22.8	73	34	11	32
368	E599N569	230-240	BWS		1A,1S		2.2	31	24	3	12
340	E602N571	237	WV		1A		8.7	63	28	6	21
664	E602N569	218	TWS		2A		2.1	25	18	6	33
327	E599N569	224	BWS	+		1S,A	11.6	49	31	10	32
848	E600N559	170-180	BWS		1R,S,A;						
					1A		41.1	64	54	19	35
Area C											
1486	E798N779	510-520	BWS		1A		2.6	27	18	6	33
1487	E798N779	517	BWS		1A	1A	4.9	36	20	10	50
1468	E798N779	524	BWS	+	1A	1S	4.8	41	19	6	31
1460	E798N779	534	BWS	+	1A		9.9	44	33	9	27
1638	E798N780	504-520	BWS		1S		4.1	31	28	5	17
1232	E798N781	537	BWS		1A		4.9	35	22	7	31
1209	E798N781	560	BWS		2A		6.2	36	24	16	66

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Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
1173	E798N782	546	BWS			1A	6.4	39	18	9	50
1161	E798N782	553	BWS	+	2A		25.2	49	32	20	62
1888	E799N779	500-510	BWS	+	1S		5.1	38	20	7	35
1445	E799N779	530-540	BWS		1P,1A		6.1	37	26	8	30
1449	E799N779	535	BWS		1S		2.6	26	21	5	23
1898	E799N779	540-550	BWS		1A		5.5	41	18	7	38
1897	E799N779	540-550	BWS		1A		.4	20	9	2	22
1294	E799N781	518	BWS		1S,A		3.0	22	20	6	30
1298	E799N781	530-540	BWS		1A		1.4	29	15	4	26
1305	E799N781	532	BWS	+	1A		6.3	46	28	8	28
1301	E799N781	538	BWS		1A	1A,R	6.9	40	28	7	25
1312	E799N781	540-550	BWS		1A,P	1S	9.7	40	25	5	20
1313	E799N781	542	BWS		1S		12.2	55	27	12	44
1315	E799N781	544	BWS		1A	1S,R	36.2	54	48	18	37
1101	E799N782	530-540	BWS		1A	1A	3.5	33	20	6	30
1102	E799N782	533	BWS	+	2A		9.6	38	30	11	36
1096	E799N782	543	BWS		1A,R		1.2	28	14	3	21
1010	E799N784	530-540	BWS		1A,S		5.3	86	25	7	28
1846	E800N779	520-530	BWS			1S,P	3.2	29	19	5	26
1711	E800N780	510-520	BWS	+	1R,S		2.9	27	18	7	38
1699	E800N780	520-530	WV		2A		5.6	38	27	6	22
1706	E800N780	526	BWS		1A		16.6	44	32	15	46
1702	E800N780	529	BWS	+	1S,R,P		5.0	39	25	5	20
1324	E800N781	518	BWS		1A		8.5	50	20	8	40
1323	E800N781	519	BWS		1S,A		6.6	37	36	5	13

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Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR***		WEIGHT (g)	DIMENSIONS			I.R.
					Convex Straight	Concave		Length (mm)	Width (mm)	Thickness (mm)	
1329	E800N781	520-530	BWS	+	1S		1.6	20	17	5	29
1337	E800N781	530	BWS		1A		10.1	44	36	7	19
1338	E800N781	535	BWS		1A		5.2	30	23	9	39
1262	E800N782	530	BWS		1A		5.2	33	24	7	29
1270	E800N782	545	BWS		1S		8.8	38	31	9	29
807	E800N784	530-540	BWS	+		1S	3.6	30	25	7	28
1399	E801N779	505	BWS	+		1A	21.9	49	38	17	44
1389	E801N779	510-520	BWS			1S	24.8	44	33	16	48
1409-1	E801N779	520-530	BWS		1A		2.9	28	27	4	14
1411	E801N780	521	BWS		1A,S		4.6	27	25	11	44
1417	E801N780	488-500	BWS		1A		2.5	34	17	5	29
1434-1	E801N780	500-510	BWS		1A		22.0	46	42	17	40
1433	E801N780	500-510	BWS		1A,1S		6.3	33	22	12	54
1532	E801N780	510-520	BWS	+	1A;1S,A	1A,S	12.1	57	30	9	30
1510	E801N781	523	BWS		1A,S	1A,S	2.2	31	20	4	20
1180	E801N782	506-520	BWS		2S		2.4	35	21	5	23
1184	E801N782	540-550	BWS		1A		8.3	38	27	9	33
1185	E801N782	545	BWS		1A,S		14.5	48	34	12	35
1745-1	E802N778	480-490	BWS			1A	1.1	20	17	3	17
1745-2	E802N778	480-490	BWS			1A	1.1	19	15	5	33
1735	E802N778	494	BWS		1A		5.6	35	31	6	19
1724	E802N778	510-520	BWS		1A		17.9	48	33	15	45
1726	E802N778	510	BWS		1S		.7	16	12	4	33
1945	E802N780	500-510	BWS			1S	3.2	36	18	6	33
1936	E802N780	527	BWS		1R,S		5.9	20	15	5	33

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Table 90. Descriptive data for complete unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex	Concave Straight	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
1964	E802N783	530-540	BWS			1S	2.3	24	16	6	37
1965	E802N783	535	BWS		2A,1P		44.0	78	47	18	38
1553-1	E802N784	530-540	BWS	+	1A		2.7	30	18	9	50
1567	E802N784	550-560	BWS		1A		6.5	45	31	6	19
1569	E802N784	552	BWS		2A		48.7	69	51	15	29
1511	E801N781	521	BWS		2A		7.9	42	25	10	40
1366	E802N782	520-430	BWS		2A		2.2	28	14	5	35
1685	E800N780	540-550	BWS			1R	5.9	39	33	9	27
153	E629N579	172	BWS	+	1R		5.8	45	19	10	52
1787	E802N779	481-490	TWS		1R		2.1	32	24	4	16
43-1	E629N599	240-250	BWS	+	1R		7.1	33	32	9	28
367	E599N569	230-240	BWS			1R	18.8	61	24	6	25
976	E800N778	520-530	BWS		1A		.9	18	13	3	23
981	E800N778	525	TWS		2A		2.1	23	20	5	25

*Material type: (BWS) Blue Winterset, (TWS) Tan Winterset, (WV) Westerville
** Cortex surfaces: (WX) Weathered
*** Edge wear: (A) Attrition, (P) Projection, (R) Retouched, (S) Step flake

Table 91. Descriptive data for broken unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE*	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
Area A											
313-6	E599N569	220-230	BWS		1A		.4	17	10	2	20
324	E599N569	228	BWS		1S,R		2.8	31	20	5	25
369	E599N569	231	BWS	+	1A		3.1	36	19	5	26
373	E599N569	232	BWS		1S		4.8	35	25	5	2
372	E599N569	232	BWS		1S		2.0	20	18	5	27
587	E599N570	225-230	BWS		1S		9.4	39	22	10	45
519	E599N570	230-240	BWS		1A		3.1	30	23	6	26
679-2	E599N571	240-248	BWS			1A	2.0	36	23	4	17
679-4	E599N571	240-248	BWS	+	1S		6.7	36	22	8	36
619-2	E600N559	180-190	BWS		1A		.6	20	12	4	33
619-3	E600N559	180-190	BWS		2A,S,R		2.0	31	20	3	15
731	E600N569	212-220	BWS	+	1A		6.4	34	20	10	50
772	E600N569	220-230	TWS		1S		4.1	34	33	7	21
864	E600N569	231	BWS	+	1S,A		10.9	41	28	14	5
742-2	E600N571	240-250	BWS		1S		.7	19	11	5	45
740	E600N579	240-250	BWS			1A	2.1	27	26	3	11
504	E600N579	270-280	BWS		1P		1.4	22	16	3	18
716-2	E600N579	280-290	BWS		1A	1A	4.2	36	29	7	24
830-2	E601N559	170-180	BWS			1S	.7	21	17	2	11
351-2	E601N559	180-190	BWS		1S		3.8	35	26	6	23
417-3	E601N569	210-220	BWS			1A	1.4	22	18	4	22
661	E602N569	206-220	BWS			1S	5.6	34	24	9	37
663	E602N569	206-220	BWS		1A		1.6	51	16	4	25
529	E602N569	220-230	BWS		1P		.8	20	11	7	63
528	E602N569	220-230	BWS	+		1S	6.1	35	27	8	29

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Table 91. Descriptive data for broken unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE**	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
382-1	E602N569	230-240	BWS	+	1S,A		.7	20	14	3	21
382-2	E602N569	230-240	BWS		1S,A		1.4	26	18	4	22
567	E602N570	211	BWS		1A		5.7	45	21	7	33
465-1	E602N570	220-230	BWS	+	1S		7.2	43	23	11	47
465-?	E602N570	220-230	BWS		1A,S		8.4	33	26	9	34
473	E602N570	222	TWS		1S,R		9.0	39	27	10	37
497	E602N571	213-220	BWS		1A		5.1	35	27	6	22
498	E602N571	213-220	TWS	+	1A	1S	4.0	32	24	8	33
496	E602N571	213-220	BWS	+		1A	5.8	39	22	7	31
699	E602N571	220-230	BWS	+	1S,P		3.6	33	16	8	50
330	E602N571	230-240	BWS		1A		2.1	22	11	10	90
88-1	E628N579	160-170	BWS	+	1A		1.4	31	13	5	38
117	E628N579	176	BWS	+		2A	4.8	31	24	8	33
122	E628N579	180-190	TWS		1P		2.2	26	18	6	33
258	E628N579	199	BWS	+		1A	30.0	55	50	12	28
289-2	E628N599	226-230	BWS		1S		1.9	26	20	3	15
52	E628N599	230-240	BWS	+	1S		2.9	27	18	7	38
55	E628N599	236	BWS	+	1A		5.2	39	35	5	14
161	E628N599	240-250	BWS	+	2A,S		4.1	32	31	5	16
190	E629N579	160-170	BWS	+	1A	1A	1.4	27	12	6	50
104	E629N579	234	BWS	+	1A,S		68.3	84	46	21	45
176	E630N479	203	BWS		1P		2.2	25	22	6	27
300	E630N569	150	BWS	+	1A,S	1S	14.0	39	38	13	34
140	E640N589	166-180	BWS	+	1P	1A,S	3.1	28	25	7	28
2166	E640N589	190-200	BWS		1A,S		.8	24	13	4	307

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Table 91. Descriptive data for broken unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE**	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
2183	E640N589	199	BWS	+	3A,S		15.1	55	43	6	13
2178	E640N589	220	BWS		1A,S		3.8	45	21	4	19
2118	E654N569	180-190	BWS			1A	.4	14	9	3	33
787	E600N569	220	BWS	+	1P		1.5	37	12	5	41
784	E600N569	223	BWS		1A,P		3.0	32	20	7	35
467	E602N570	220-230	BWS		1P,A		4.6	34	22	9	40
769-1	E600N569	220-230	BWS		1P,A		2.7	28	21	7	33
786	E600N569	228	BWS		1A,S,P	1A	9.8		30	8	26
Area C											
1497	E798N778	500-510	TWS		1R,S		1.0	27	13	3	23
1606	E798N778	510-520	BWS			1A,S	2.0	23	17	7	41
1475-1	E798N779	500-510	BWS	+	1A		2.2	27	21	4	19
1607	E798N779	510-520	BWS		1A		1.8	24	21	4	19
1216	E798N781	541	BWS		1A,S;1A		5.0	40	25	5	20
1147	E798N782	519-530	BWS		1S		.9	20	11	3	27
1103	E798N782	538	BWS		1P,1A		4.4	47	18	6	33
1170	E798N782	547	BWS		1A	1A	8.2	39	29	10	34
1122	E798N783	530-783	BWS	+	1A		.8	20	13	4	30
1573	E799N778	510-520	BWS		1A	1A	3.9	31	16	8	50
1572	E799N778	510-520	BWS		1A		.5	17	9	4	44
1285	E799N781	520	BWS		1S,A		2.1	23	15	5	33
1302	E799N781	538	BWS		1P		16.1	68	24	3	12
1113	E799N782	528	BWS			1A	3.0	27	21	6	28
1238	E799N783	530-540	BWS		1A,P		.7	17	11	5	45
1239	E799N783	535	BWS		1S		7.2	40	35	6	17
755	E799N784	547	BWS		2A		1.8	25	18	4	22

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Table 91. Descriptive data for broken unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE**	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
987	E800N778	490-500	BWS		1A		2.7	30	18	5	27
995	E800N778	500-510	BWS		1S,P		2.6	30	15	8	53
977	E800N778	520-530	BWS			1A	.6	20	14	2	14
1855	E800N799	486-500	BWS		1A		1.4	21	13	6	46
1871	E800779	530-540	BWS		1P		5.4	40	19	14	73
1330	E800N781	522	BWS			1S	5.3	30	21	11	52
1335-1	E800N781	530-540	BWS		1P		2.8	28	25	5	20
1335-2	E800N781	530-540	BWS		1S,1A		3.1	27	18	6	33
1254-2	E800N782	520-530	BWS	+	1A		2.5	18	15	9	60
1261	E800N782	538	BWS		1S		1.2	23	15	3	20
1276	E800N782	550	BWS		1A		2.2	39	18	3	16
887	E800N784	540-550	WV			1S	2.9	33	21	6	28
1829	E801N778	490-500	BWS		1S		1.6	23	12	6	56
1396	E801N779	500-510	BWS		2A,S		2.4	27	18	4	22
1400	E801N779	504	BWS		1A,1S		2.0	23	20	4	20
1390	E801N779	510-520	BWS		1S		56.9	66	40	27	67
1109	E801N779	520-530	BWS		1A,S		1.1	21	15	15	100
1409-2	E801N779	520-530	BWS		1A,S		2.9	28	27	4	14
1434-2	E801N780	500-510	BWS		1A		1.9	32	14	6	42
1534	E801N781	513	BWS	+	1A		3.1	22	18	10	55
1186	E801N782	549	BWS		1A		2.8	32	23	4	17
1072	E801N784	538	BWS		1A		4.3	42	23	5	21
1071	E801N784	539	BWS		1A		6.6	32	22	9	40
1758	E802N778	479-480	BWS		2A		2.2	24	21	4	19
1757	E802N778	479-480	BWS		1A		1.0	23	15	3	20

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Table 91. Descriptive data for broken unifacial tools (edge-modified flakes) from 23JA35.
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CATALOG NUMBER	PROVENIENCE	DEPTH BELOW DATUM	MATERIAL TYPE**	CORTEX SURFACES**	EDGE SHAPE AND WEAR*** Convex Straight	Concave	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)	I.R.
1743	E802N778	480-490	BWS	+	1S		1.9	17	14	9	64
1743	E802N778	480-490	BWS	+	1A		2.4	24	16	4	25
1744	E802N778	480-490	TWS	+		1S	1.2	24	10	5	50
1752-3	E802N778	500-510	BWS		1P	1A	.8	19	16	3	18
1786	E802N779	481-490	BWS	+	1S		5.8	38	20	8	40
1788	E802N779	481-490	BWS		1S		1.4	26	16	4	25
1800	E802N779	498	BWS		1R,S		6.5	35	26	9	34
1778	E802N779	510-520	BWS	+	1A		5.4	38	25	8	32
1934	E802N780	520-530	BWS		1A,P	1A	2.6	30	18	6	33
1935	E802N780	521	BWS		1A		5.6	36	20	9	45
1963	E802N783	530-540	BWS			1S	5.5	45	18	7	38
1545	E802N784	520-530	BWS		1A		2.2	27	16	4	25
1562	E802N784	540-550	BWS		1A		.8	26	12	3	25
1776	E802N779	510-520	BWS		1A,P		.6	19	10	4	40
1929	E802N780	483-500	BWS	+	1R		4.0	32	24	8	33
637	E639N589	187	BWS	+	1R		2.5	31	24	6	25
474	E798N749	506-510	BWS		1A		6.4	38	29	5	17
1753	E802N778	500-510	BWS	+	1A		2.4	31	28	6	21

*Material type: (BWS) Blue Winterset, (TWS) Tan Winterset, (WV) Westerville
**Cortex surfaces: (WX) Weathered
***Edge wear: (A) Attrition, (P) Projection, (R) Retouched, (S) Step flake

configuration of the perimeter of the flake where edge modification occurs. These include concave (notching), straight, convex and projecting shapes. The latter are pointed edges which are the utilized juncture of two acute edges or intentionally fashioned tips or bits. Edge wear patterns include step fracture and attrition. These two variables define the kind of motion responsible for the edge modification. Step fractures are multiple, overlapping, vertically oriented flake scars placed along the edge of the flake. The termination of the flake scars are abrupt, and, when viewed in cross-section, an irregularly spaced set of "steps" is formed along the working edge. It has been determined through replicative studies that step fractures result from a scraping motion (Chapman 1977; Lawrence 1979) during which the edge is held on a surface of some material and moved in a direction perpendicular to the long axis of the edge while pressure is being exerted downward (Chapman 1977:383).

Retouch is an edge condition which is the result of intentional edge modification. Retouch flake scars are larger and deeper than step fractures. The termination of retouch scars are also less hinged when compared to step fracture scars. They tend to terminate smoothly in a "typical concoidal fashion" (Chapman 1977:383). Retouch is a "pre-use" modification of the artifact edge.

Attrition is a wear pattern attributed to "sawing" or "cutting" motions. Attrition flake scars are oriented obliquely to the edge of the artifact. They are usually stepped along the very perimeter of the artifact. On the surfaces immediately adjacent to the perimeter, however, the scars terminate smoothly (Lawrence 1979:384).

Most of the complete flakes are non-cortical (n=104, 62 percent). The presence of cortex on a tool can indicate at what point the "blank" was detached during the process of reducing raw materials. A cortical flake is assumed to be among the first flakes detached since reduction of stone requires the successive removal of flakes starting with the natural outer (cortical) surfaces. The cortical flakes are about 5 mm larger than the non-cortical flakes and more robust (Table 92). This difference in size is perhaps to be expected. Strictly speaking, those flakes removed early in the sequence (i.e., cortical flakes) should be larger since the parent stone becomes increasingly smaller with each flake detached.

The entire sample of 167 complete flake tools was selected for analysis of metric and discrete group characteristics. Complete flakes were used in order to better estimate "blank" selection patterns and to determine sizes or characteristics of unmodified flakes prior to use as tools. Table 93 summarizes the length, width, and thickness measurements. Mean maximum length for the complete flakes is 40.3 ± 16.8 (Table 93), and more than two-thirds of these are greater than 30 mm. Reid (1978:153) considers this size to be the minimum dimension for hand held flake tools. Flakes larger than 30 mm possess a surface area which permits the worker to grip the flake effectively and thus allows more force to be concentrated on the working edge than would be possible with flakes held only between the terminal joints of the first two or three digits (1978:152).

The complete flakes were also examined for distribution of edge wear variables, in particular attrition and step fractures. The sample (n=161) is

Table 92. Comparison of size characteristics between complete cortical and non-cortical flakes.

	CORTICAL FLAKES (n=63)	NON-CORTICAL FLAKES (n=104)
Maximum dimension (length) mm		
$\overline{X}$	43.90	37.29
S	13.25	13.73
INDEX OF ROBUSTNESS		
$\overline{X}$	33.74	30.33
S	10.98	12.04

Table 93. Summary statistics for complete edge-modified flakes.

	N	$\overline{X}$	S
Length (mm)	167	40.3	16.8
Width (mm)	167	25.9	8.9
Thickness (mm)	167	8.5	4.5

Table 94. A 2x3 contingency table and analysis for the association of edge-damage factors on complete cortical and non-cortical flakes from 23JA35.

	Attrition	Scraping	Attrition&Scraping (composite)	Ni
Cortical flakes	26	25	12	63
Non-cortical flakes	54	20	24	98
Nj	80	45	36	161

Contingency statistics:

D.F. = 2
X^2 = 7.08
$P(X^2)$ = .971
Confidence level = .90
Ho: $P(X^2) \leq .90$

Table 95. A 2x2 contingency table and analysis for the association of attritional and scraping wear on complete cortical and non-cortical flakes from 23JA35.

	Attrition	Scraping	Ni
Cortical flakes	26	25	51
Non-cortical flakes	54	20	74
Nj	80	45	125

Contingency statistics:

D.F. = 1
X^2 = 6.338
$P(X^2)$ = .988
Confidence level = .90
Ho: $P(X^2) \leq .90$

slightly reduced since those with only deliberate retouch or projections were omitted. Most (49.6 percent) showed only attrition damage. Step fractures accounted for 27.9 percent, and combinations of attrition wear and step fractures accounted for 22.3 percent. These figures indicate that about half of the sample was used for "cutting" or "sawing"; about a third for "scraping" and about a fourth for both purposes.

There are differences in the distribution of these variables among cortical and non-cortical tools. A Chi-square test calculated for the two by three contingency table of edge damage types indicates that there may be deliberate selection of cortical vs. non-cortical flake blanks for use either as cutting or scraping tools (Table 94). This table was reduced to a two by two contingency in order to pair attributes and isolate the discrepancies. The distribution of tools with step fractures vs. attrition damage is significantly different. Both types of wear occur almost equally on the cortical flakes. For the non-cortical there is a tendency for most edges to exhibit only attritional wear (Table 95). These figures indicate that there is some selection of cortical flakes for use as scraping tools and non-cortical flakes for cutting tools.

Composite tools with both types of wear damage were fewer in number. Apparently it made no difference whether or not they were cortical (Table 96). There is reason to suggest that these composites were used for butchering among other tasks. Frison (1979:285) indicates that the process of butchering is complex and one would want a tool with a deliberately designed edge, for cutting and scraping meat off the carcass. Keeley (1979:285) supports the idea that a variety of motions are required during the butchering process since the butcher will encounter a number of different materials whose processing requires various motor skills.

Table 96. A 2x2 contingency table and analysis for the association of attritional wear and scraping/attritional wear on complete cortical and non-cortical flakes from 23JA35.

	Attrition	Scraping&Attrition (composities)	Ni
Cortical flakes	26	19	45
Non-cortical flakes		54	24
	—	—	—
Nj	80	43	123

Contingency statistics:

D.F. = 1
X^2 = .0078
$P(X^2)$ = .070
Confidence level = .90
Ho: $P(X^2)$ .90

In summary, the unifacial flake tools from 23JA35 are a locally derived set of implements. The majority of these show evidence as being used mainly for cutting tools. Most of these are non-cortical flakes, which are somewhat smaller and less robust than cortical flakes. Cortical flakes were variously for cutting, scraping, and composite tasks.

Manufacturing Debris

Complete Tabular Cores (n=12)

Tabular cores are modified tabloids (see below) which were intended for the production of flake tools and/or bifacially worked implements. These retain the rectanguloid configuration of tabloids and one or more natural surfaces. Although the flake removal pattern is often bifacial these artifacts are not considered formal tools since there is no secondary retouch and edge shaping (Fig. 152). Table 97 presents descriptive data for these artifacts.

Tabular cores are perhaps the most ambiguous set of artifacts in the chipped-stone assemblage from 23JA35 and possibly in all Winterset chert-based lithic industries. It is difficult to state whether the form was intended to be reduced to a more symmetric heavy or light duty tool, or whether the piece served as a blank from which the flake tools were derived.

Tabular Core Fragments (n=14)

Tabular core fragments are usually split transversely and in segments large enough to consider them derived from pieces similar to complete specimens. The specimens are all Winterset chert. Along their fracture planes each exhibits raw material inconsistencies such as numerous intersecting joint planes, calcite, or crystalline inclusions. This of course indicates that these species were not suitable for further reduction into bifacial tools or flake tools. Regardless of the artisan's intentions for these pieces, their presence in the archaeological record can be explained by the abandonment of inferior raw material. Table 98 lists these specimens in inventory form.

Block Cores (n=2)

Block cores are relatively large and robust pieces of chert from which large flakes were detached in an unsystematic manner. In cross-section they tend to be more square than rectanguloid compared to tabular cores. Both of these specimens exhibit smooth, homogenous internal surfaces indicating good quality raw material. They are suitable for the production of flake-derived tools and, because there proportions, for use as hammerstones (see below).

Tabloids (n=4)

Tabloids are raw pieces of chert with two pairs of intersecting and relatively parallel, natural surfaces. They are usually rectangular in overall configuration. They exhibit no flake scars which can be interpreted as intentional modification and, as such, probably represent raw "blanks" from which some of this lithic assemblage was produced. However, none of them exhibit any visible natural joint or cleavage planes. They are potentially good quality raw materials which were not selected for reduction.

Table 96. A 2x2 contingency table and analysis for the association of attritional wear and scraping/attritional wear on complete cortical and non-cortical flakes from 23JA35.

	Attrition	Scraping&Attrition (composites)	Ni
Cortical flakes	26	19	45
Non-cortical flakes	54	24	78
Nj	80	43	123

Contingency statistics:

D.F. = 1
X^2 = .0078
$P(X^2)$ = .070
Confidence level = .90
Ho: $P(X^2) \leq .90$

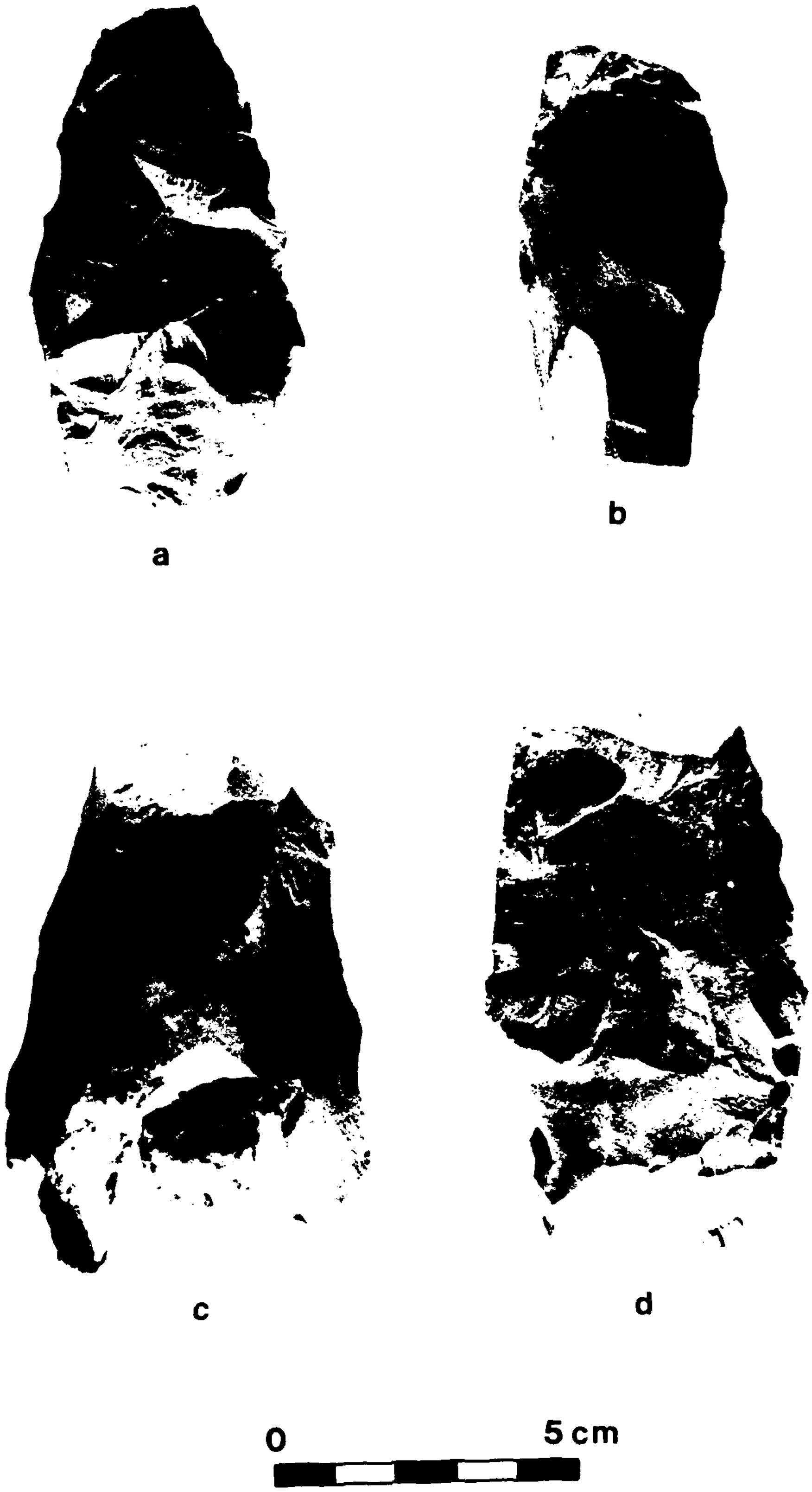

Figure 152. Tabular cores from 23JA35.

Table 97. Descriptive data for complete tabular cores from 23JA35.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH	MATERIAL TYPE*	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
Area C							
1160	E798N782	41	BWS	156.9	113	63	29
1848	E800N779	41	BWS	90.2	68	68	24
1812	E801N778	28	BWS	114.5	108	58	18
1437	E801N780	33	BWS	290.3	105	64	41
Trench 1							
10			BWS	46.7	58	50	34
11			BWS	107.3	76	50	26
21			BWS	243.5	81	64	52
Area A							
524	E599N570	9	BWS	118.8	60	44	40
710	E599N571	5	BWS	132.5	85	53	29
476	E601N571	7-17	BWS	75.3	59	46	28
124	E628N579	28	BWS	89.5	88	45	24
107	E629N599	15	BWS	111.6	76	70	19
177	E630N479	45	BWS	184.7	83	45	45
Area B							
955	E800N695	5	BWS	178.7	92	70	78
2054	E800N718	10-20	BWS	149.9	69	62	32
2056	E800N719	0-15	BWS	182.9	112	47	32

*BWS = Blue Winterset.

Chunks (n=26)

Chunks are angular, multifaceted, and amorphous pieces of chert which exhibit no systematic flake removal. They are either fragments of tabloids, tabular cores, or block cores. They may have resulted from flaws inherent in larger pieces of raw material or from misapplied production techniques. They exhibit no secondary retouch and most likely represent waste by-products. Since it is difficult to specify their origins, their analytical utility is somewhat diminished when compared to other chipped stone artifacts. All chunks from 23JA35 are of Winterset chert. Table 99 lists the specimens in inventory form.

Debitage (n=26,555)

Debitage represents small unused by-products of the chipped-stone industry. It consists primarily of flakes (n=24,696, 93 percent) and smaller amounts (n=1858, 7 percent) of small angular pieces of chert or shatter. It is estimated that over 95 percent of the debitage is local Winterset chert.

Ground Stone

Chert (n=10)

This series of artifacts consists of ten blocks or tabloids of Winterset chert whose natural surfaces exhibit partial modification produced by battering, pecking, or smoothing (Fig. 153). Variables recorded for these artifacts include maximum length, width, and thickness; width/thickness indices; wear type, including battering, smoothing, smoothing over battering and extent of surficial modification (less than 50% or greater than 50%).

A plot of width/thickness ratios for each tool indicates subgroups which are distinct in terms of overall proportions. Four specimens (13, 11, 840 and 106) have width/thickness ratios less than 1.5 and six (8, 362, 734, 474, 242, and 762) are greater than 1.5 (Table 100). These artifacts are proportionately similar to blocky and tabular cores, respectively. According to Table 100, the blocky artifacts were subjected to more utilization, seen both in the surface area modified as well as the combinations of wear type. The tabular specimens exhibit only limited modification which is restricted to battering on one end of the artifact.

These artifacts carry a variety of functional implications. They can be considered hammerstones (battering) and/or grinding stones (smoothing). The blocky specimens appear to have been desired for both purposes, and the tabular specimens used less extensively. Uses of these artifacts include: (1) percussors for the purpose of flake removal; (2) grinders, for striking platform preparation; (3) pecking stones, for creating other groundstone tools; and (4) hematite grinding, as evidenced by specimen 840.

Ground Minerals (n=15)

This series of artifacts consists of relatively small pieces of minerals which were scratched and polished, probably for the purpose of producing pigments. Fourteen (65 g) are fragments of hematite. Of these five small pieces (2.1 g) exhibit a series of multiple overlapping shallow groves or scratches. Eight (53 g) are larger pieces which exhibit a high surface polish. Two pieces (9.9 g) exhibit surface condition (Table 101).

Table 98. Descriptive data for tabular core fragments from 23JA35.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH	MATERIAL TYPE*	CORTEX	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
Area A								
370	E599N569	12	BWS		57.4	61	42	19
490	E601N571	7	BWS		39.0	59	42	19
Area C								
1454	E799N779	33	BWS	+	85.3	62	56	29
1033	E799N783	27	BWS	+	104.6	55	72	22
1217	E798N781	35	BWS		210.5	92	80	38
1258	E800N782	20-30	BWS	+	22.9	42	30	26
1922	E802N780	37	BWS	+	64.6	45	66	22
1811	E801N778	33	BWS	+	117.2	65	62	26
1918	E802N780	27-37	BWS	+	74.0	91	49	23
Trench 1								
32			BWS	+	56.9	80	36	22
35			BWS	+	82.3	66	55	24

*Material type: (BWS) Blue Winterset.

Table 99. Descriptive data for chunks from 23JA35.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH	MATERIAL TYPE*	CORTEX	WEIGHT (g)	DIMENSIONS Length (mm)	Width (mm)	Thickness (mm)
Area A								
524	E599N570	9	BWS	+	118.8	60	44	40
326	E599N569	2	BWS	+	55.7	54	45	31
549	E601N559	1	BWS		38.1	64	41	28
432	E601N569	7	BWS	+	61.5	47	38	30
431	E601N569	7	BWS		39.3	53	38	24
450	E601N569	11	BWS		45.6	55	28	26
668	E602N569	13	BWS		56.2	65	40	22
568	E602N570	6	BWS		84.1	61	48	29
573	E602N570	7	BWS	+	16.5	40	24	18
471	E602N570	13	BWS		72.6	65	40	30
472	E602N570	13	BWS		139.1	65	43	41
124	E628N579	28	BWS	+	89.5	88	45	24
294	E628N599	3	BWS		16.2	49	31	17
194	E629N579	11	BWS	+	27.5	47	35	17
37	E629N599	26-36	BWS	+	18.1	42	26	20
110	E629N599	18	BWS	+	75.6	64	43	23
287	E629N599	43	BWS	+	38.6	53	33	26
Area C								
1024	E799N783	33	BWS	+	48.4	50	41	26
1470	E798N779	35	BWS	+	35.3	61	25	32
1210	E798N781	26-36	BWS	+	22.3	45	37	17
982	E800N778	43	BWS	+	90.2	68	68	24
1704	E800N780	27	BWS	+	82.2	71	51	33
1085	E800N783	39	BWS	+	22.9	42	30	26
1833	E801N778	41	BWS	+	12.9	36	22	21

(continued)

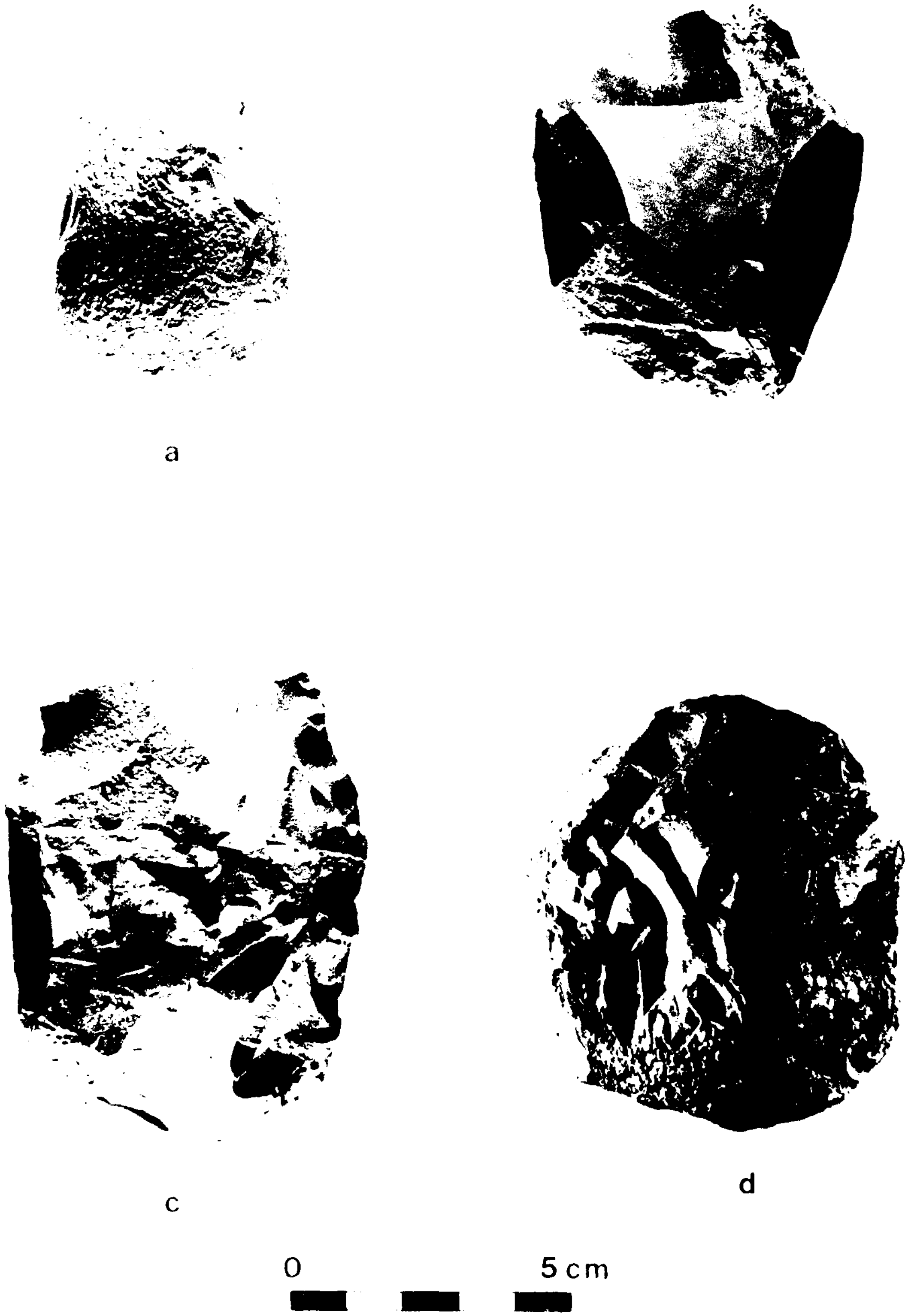

Figure 153. Ground stone chert (hammerstones) from 23JA35.

Table 99. Descriptive data for chunks from 23JA35.

CATALOG NUMBER	PROVENIENCE	DATUM DEPTH	MATERIAL TYPE*	CORTEX	WEIGHT (g)	DIMENSIONS (mm) Length	Width	Thickness
Trench 1								
6			BWS	+	46.7	58	50	34
Trench 3								
3			BWS	+	98.2	58	51	41
9			BWS	+	75.4	81	45	31
14			BWS	+	75.7	55	46	34
2085	E770N713	0-20	BWS	+	348	52	28	25

Table 100. Descriptive data for ground chert from 23JA35.

CATALOG NUMBER	PROVENIENCE	DEPTH (cm.bs.)	MATERIAL TYPE*	WEAR TYPE**	EXTENT OF WEAR	WEIGHT (g)	DIMENSIONS (mm) Length	Width	Thickness	Width/Thickness
Area A										
734	E600,N569	3	BWS	B/S	50%	189.8	75	65	35	1.85
362	E601,N571	14	BWS	B	50%	178.7	85	64	41	1.80
840	E601,N571	32	TWS	B/S	50%	228.7	79	55	43	1.27
474	E602,N570	0-7	BWS	B	50%	273.6	93	68	37	1.83
106	E629,N599	0-17	BWS	B/S	50%	167	60	49	43	1.13
242	E631,N569	0-12	BWS	B/S	50%	89.5	69	52	26	2.00
Area C										
762	E799,N784	30	BWS	B	50%	125.4	86	43	26	1.65
Trench 3										
8			BWS	B	50%	235.2	70	69	40	1.72
11			BWS	B/S	50%	436	82	73	62	1.17
13			BWS	B/S	50%	388	94	69	52	1.32

*BWS = Blue Winterset; TWS = Tan Winterset
**B = Battering; S = Smoothing; B/S = Smoothing over battering.

Table 101. Descriptive data for ground hematite and limonite.

CATALOG NUMBER	PROVENIENCE	DEPTH (bd)	MATERIAL TYPE	SURFACE CONDITION	WEIGHT (grams)
Area A					
322	E599,N569	226	Hematite	scratched/polished	5.0
9	E629,N599	258	Hematite	polished	30.5
Area C					
1099-1	E799,N782	530-540	Hematite	polished	1.3
756	E799,N782	550-560	Hematite	polished	.7
1259	E800,N782	530-540	Hematite	polished	2.8
2005-1	E800,N783	530-540	Hematite	polished	.5
1000-2	E800,N778	510-520	Hematite	scratched	1.3
1816-1	E801,N778	520	Hematite	scratched	.8
1424-1	E801,N780	520-530	Hematite	scratched	.8
1196	E801,N782	532	Hematite	polished	6.4
1772	E802,N779	510-520	Hematite	scratched	.5
1954	E802,N783	520-530	Hematite	polished	8.2
1961-2	E802,N783	530-540	Hematite	polished	2.6
868	E829,N784	520-530	Hematite	scratched/polished	4.9
1984	E830,N833	670-680	Limonite	scratched	2.6

One of the polished pieces (specimen 9) has two sharply convergent polished surfaces. The juncture of these surfaces form a 55 degree angle (Fig. 154a).

Worked Quartzite (n=1)

This specimen is a small fragment of smooth pink quartzite with one rounded and one relatively flat surface. This configuration conforms in cross-section to a rounded rectangular mano. Its edges are blackened, probably resulting from thermal fracture.

Worked Sandstone (n=1)

This artifact consists of two cross-mended fragments of tan sandstone. Together they form a slab measuring 163 mm long, 72 mm wide, and 40 mm thick. One surface is concave and smoothed. Two surfaces are broken; two appear to be the stone's natural exterior. The condition of the modified surface indicates that it was probably a fragment of a metate or grinding slab (Fig. 154b).

Unworked Stone

A total of 2086 pebbles and cobbles were collected from 23JA35. They were distributed across the site with no apparent concentration. Most were recovered from the plow zone. Limestone slabs and cobbles are common components of prehistoric hearths in the Kansas City area and, depending on their proximity to the fire, may or may not show evidence of thermal treatment. Limestone hearths were recovered at the site (Wilson 1963). It is that these stones may, in part have been associated with prehistoric cooking activities.

A total of 27.9 g of unworked hematite and .4 g of unworked limonite were recovered from the excavation. The mean and standard deviation for the weights of the hematite (3.48 ± 3.44 g) is only slightly smaller than those for the worked hematite (4.73 ± 7.81 g). These unused pieces may be fragments of larger utilized specimens of naturally occurring deposits.

FAUNAL REMAINS

Limited faunal remains were recovered from the 23JA35. The samples include 12 fragments of unidentified bone. These materials were recovered from Area A and could represent intrusive historic materials. All the fragments appear to be fragments of medium to large size mammals such as deer.

The general absence of bone from this site probably results from the fact that cultural deposits were exposed on the surface for an extensive period of time. Miller (1975) has noted that bones exposed to surface conditions in desert environments for more than several decades are severely deteriorated. It is probable that deterioration would take place at a much more rapid rate in a subhumid environment such as western Missouri.

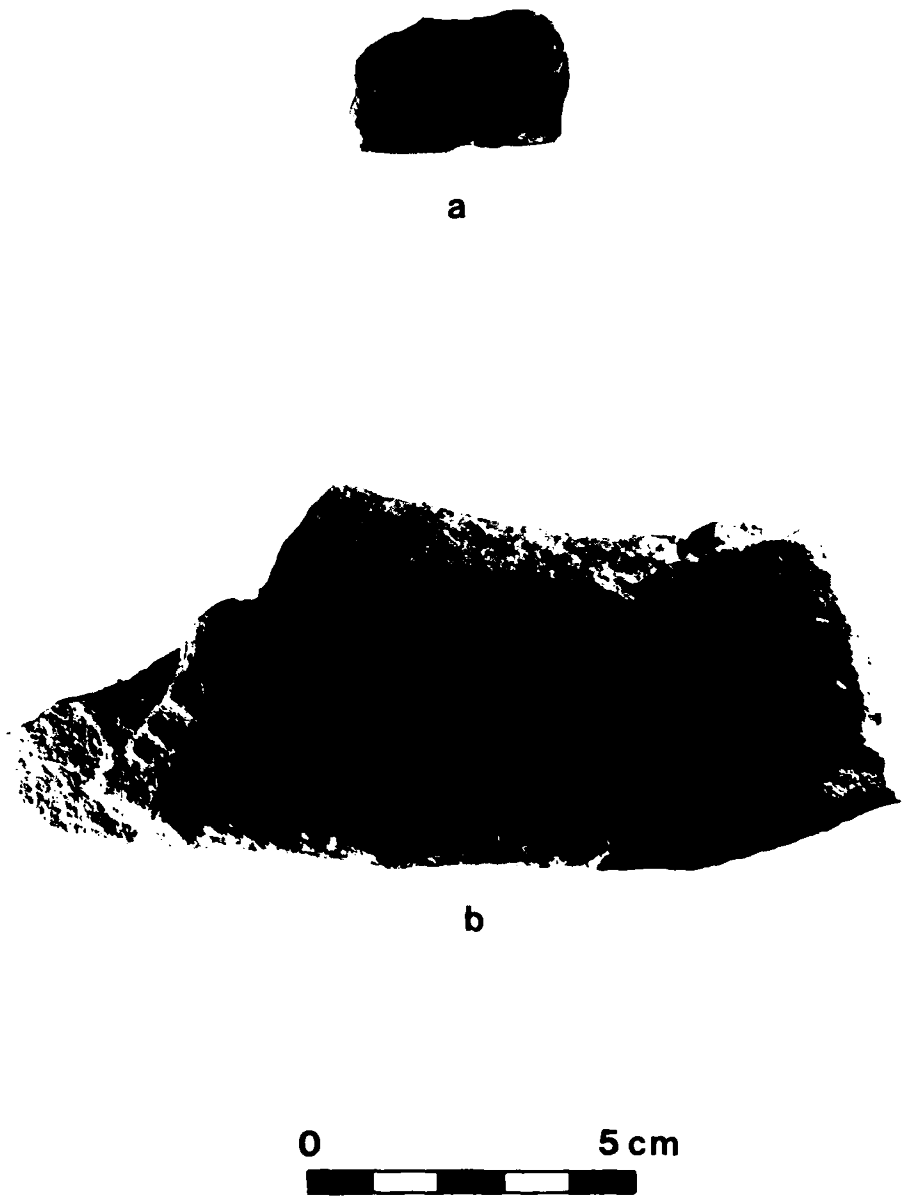

Figure 154. Ground hematite and sandstone metate from 23JA35: (a) ground hematite, (b) sandstone metate.

FLORAL REMAINS

Floral remains recovered from 23JA35 include a small quantity of carbonized nut and seed remains and a large number of uncarbonized seeds. The latter are interpreted to be intrusive modern seed rain.

Carbonized Nuts

Small fragments of carbonized nuts were recovered from the heavy fraction water screening of matrix samples from both Blocks A and B and from Features 6 and 8 (Table 102). Only those samples from the features and Block C were sufficiently large for identification. Three genera are present.

Table 102. Carbonized nuts from 23JA35.

	BLOCK A	BLOCK C	FEATURES		TOTAL	PERCENT
			6	8		
Carya cordiformis bitternut hickory		1			1	0.5
Carya ovata shagbark hickory		2			2	1.0
Carya sp. hickory			60		60	31.0
Juglans sp. walnut		3	97		100	51.5
Quercus sp. acorn			27	4	31	16.0
total		6	184	4	194	100.0
UNIDENTIFIED	9	22	80		111	
TOTAL	9	28	264	4	305	

Carya sp. (hickory) n=60

Three species of hickory are present in Jackson County (Steyermark 1963: 516-521). _C. cordiformis_ (bitternut hickory) occurs in rich and alluvial soils. _C. ovata_ (shagbark hickory) is found in lowland and upland woods. _C. texana_ (black hickory) occurs in dry rocky upland woods. Hickory nuts are available from September through October (Stephens 1973:79-86). Hickory nuts were eaten widely throughout aboriginal North America (Yanovsky 1936:16-17). In many instances they were gathered in the fall and stored for winter use.

Carya cordiformis (bitternut hickory) n=1

One hickory nut fragment from Block C was identified as _C. cordiformis_. As note, this species prefers rich alluvial soils. Nuts from this species are available in October (Stephens 1973:78).

Carya ovata (shagbark hickory) n=2

Two fragments of shagbark hickory shells were recovered from Block C. According to Steyermark (1963:517), _C. ovata_ occurs in lowland or upland woods along streams, on slopes, on limestone hills, and in dry upland areas. According to Stephens (1973:84), the nuts of this species become available in September and October.

Juglans nigra (black walnut) n=100

Fragments of _Juglans nigra_ (black walnut) were recovered from Block C and Feature 6. This species occurs in rich woods at the base of slopes or bluffs, in valleys along streams, and in open and upland woods (Steyermark 1963:510). The nuts are available in October (Stephens 1973:76). According to Yanovsky (1936:17), black walnuts were commonly eaten in aboriginal North America.

Quercus sp. (acorn) n=31

Fragments of acorn shells accounted for 81 percent of the identifiable sample of nut remains. According to Steyermark (1963:532-550), nine species of oak are present in Jackson County, Missouri. _Q Stellata_ (post oak), _Quercus prinoides_ (chestnut oak), _Q. imbricaria_ (shingle oak), _Q marilandica_ (Black Jack oak), _Q. imbricaria_ (Shummard oak) and _Q. velutina_ (black oak) are xeric-adapted species found on rocky uplands and in thin shallow soils along bluffs and valley walls. _Q. macrocarpa_ (bur oak), _Q. bicolor_ (swamp white oak), _Q. imbricaria_ (shingle oak), _Q. palustris_ (pin oak), and _Q. borealis_ (red oak) are present in alluvial soils along valleys and along streams. Acorns are principally available in October, although a few species such as _Q. prinoides_ and _Q. imbricaria_ are available in September (Stephens 1973:108-128).

Acorns were widely used for food in many parts of aboriginal North America (Yanovsky 1936:18-19). In the Plains their use among the Pawnee is recorded by Gilmore (1919:75). Acorns, in the natural state, contain large amounts of tannin and are not suitable for human consumption. A description of methods used by the Menomini to remove the tannin is provided by Smith (1923:66). He notes that the acorns were boiled until almost cooked, the water was thrown out, and fresh water and two cups of wood ashes were added. The acorns were then boiled in this lye water. They were pulled from the boiling water and simmered in fresh water to clear them of lye. The acorns were then ground into meal with a mortar and pestle and finally sifted through a birch-bark sifter.

Carbonized and Uncarbonized Seeds

The only carbonized seed recovered from 23JA35 was one Vitis sp. (grape) seed from Feature 6. A number of species including the summer grape (V. aestivalis), grayback grape (V. cinera), the riverbank grape (V. riparia) and the winter grape (V. vulpira) occur in Jackson County. Most species occur in upland or flood plain woods, thickets and banks of streams. The fruits are available in August, September, or October (Steyermark 1963:1038-1040). The seeds are dispersed by animals. There is widespread documentation of the use of a large number of species of grapes by North American Indians (Yanovsky 1936:42-43). The berries were eaten fresh, dried, or made into jellies. Gilmore (1919:102) states that in the Plains V. cinerea and V. vulpina were used by the Pawnee, either fresh or dried for winter use.

Large numbers of uncarbonized seeds were recovered from the light and heavy fraction flotation samples from Blocks A and C and the features. These appear to represent modern intrusive seed rain recently incorporated into the substratum. Since these are not associated with the prehistoric Nebo Hill occupation, they have not been analyzed in detail, although a number of samples from Block C and the features have been identified. The various seeds present in these samples are presented in Table 103. A majority of these are weedy species common in cultivated fields. At least three species are known to have been introduced with the advent of Euro-American settlement in the area.

DISCUSSION AND INTERPRETATIONS

The Turner-Casey site (23JA35) is a large upland Nebo Hill site overlooking the East Fork of the Little Blue River in Jackson County, Missouri. The site was first investigated in the early 1960's by local lay archaeologists. Subsequent test excavations were conducted in the early 1970's by the University of Kansas Museum of Anthropology. These investigations included test pits in Area A and an intensive controlled surface collection in Area B. The results of this work indicated the presence of a concentrated area of cultural debris extending along the crest (above the 900 ft contour line) of the ridge in Area A. A second large concentrated area of a lighter concentration of debris was located from central parts of Area B extending north into Area C. A third small, but highly concentrated area of material was located in the northeast corner of Area B. The 1979 investigations largely confirmed these earlier observations. Based on the results of this work, it is likely that the concentrated area of debris in the northeastern corner of Area A may extend to the northeast and be part of the concentrated area of material defined in the southwest corner of Area B. If this is the case 23JA35 may consist of two major areas or localities of prehistoric cultural materials.

The artifact sample from 23JA35 confirms earlier identifications of the site as a single component Nebo Hill phase occupation. Diagnostic artifacts such as projectile points are comparable to those from the Nebo Hill site excavated by Reid (1980) and the Sohn site reported on by Reeder (1980). According to Reid, sites of the Nebo Hill phase are spatially centered in an

Table 103. Uncarbonized seeds recovered from 23JA35.

	BLOCK B	FEATURE 5	FEATURE 6
<u>Abutilon theophrasi</u> velvet leaf		+	
<u>Amaranthus rudis</u> pigweed		+	+
<u>Ambrosia artemsiifolia</u> ragweed			+
<u>Chenopodium sp</u>. lambsquarter	+		
<u>Croton monanthogynus</u> croton			+
<u>Desmodium sp</u>. sticktight		+	
<u>Helianthus annus</u> sunflower		+	+
* <u>Lespedza stipulacca</u> Japanese clover		+	+
<u>Polygonum pennsylvanicum</u> Pennsylvania smartweed	+	+	+
<u>Portulaca mundula</u> purslane	+		
<u>Setaria sp</u>. foxtail		+	+
* <u>Silene</u> sp. catchfly			+
* <u>Sorghum halapense</u> Johnson grass		+	

* introduced species

area of northwestern Missouri defined by the lower Missouri, the Platte and the Grand Rivers and extending along the Little Blue River south of the Missouri. According to Reid, formal determinants of Nebo Hill phase sites include long, narrow, thick lanceolate points and plain-surfaced grass and sedge tempered ceramics. Other tools include bit-polished hoes similar to Sedalia diggers and bifacial gouges comparable to forms referred to as Clear Fork gouges. Rectangular bifacial knife scrapers, ovate bifacial denticulate scrapers, three-quarter grooved greenstone axes, ungrooved greenstone and hematite celts, and oval and rectangular quartzite manos are also present.

The artifact assemblage from the two areas of the site which have been intensively investigated is characterized by a relatively homogeneous sample of biconvex lanceolate light duty bifaces suitable for use as projectile points or hafted cutting and scraping tools. It is possible to make more specific functional inferences for the light duty point sample assuming edge configuration is indicative of tool use. For example, Reid (1978) considers biclinal edges to indicate cutting function while planoclinal edges are better suited for scraping tasks. According to edgeshape counts 90.7 percent of these light-duty points (complete and fragments) have only biclinal edge configurations. Five (7.6 percent) are planoclinal and one (1.5 percent) exhibited both edge shapes. Thus, the dominant edge shape indicates that the light-duty points were used as cutting and piercing tools and were well suited for general hunting and butchering tasks. The remaining points have planoclinal edges and are included in the scraping/cutting category (9.1 percent).

The heavy duty bifacial tools generally have biclinal working edges. Twenty-four (70 percent) exhibit biclinal edges, while four (11.7 percent) are planoclinal, and six (17.6 percent) are both planoclinal and biclinal. The tools with planoclinal or plano/biclinal (29.6 percent) working edges probably served as heavy duty scraping and gouging implements for woodworking. Biclinally edged heavy duty tools are better suited for penetration or cutting much as one would use an axe or a saw (Reid 1978). Among the heavy duty bifaces a small number (n=2) of biclinally-edged tools have distal facial polish. This type of wear has been attributed to digging in silty soils (Gregory et al. 1970:43; Heizer and Cook 1979:43).

Although the Turner-Casey chipped stone industry has a high percentage of bifaces, a strong flake tool preference is apparent. The large sample of unifacial flake tools are probably light duty cutting and scraping implements. As noted above, many of their functions may be attributed to butchering as well as a wide variety of light duty maintenance tasks.

Ground chert tools were most likely used as hammerstones for chipped stone tool production and as shapers for the purpose of forming other ground stone tools such as the sandstone metate recovered at the site.

The sandstone metate from Turner-Casey is good evidence for plant food preparation at the site, as is the quartzite mano. Their very low frequencies compared to those from Nebo Hill (Reid 1980) probably do not indicate relative intensity of plant preparation. First, lithics suitable for food processing (quartzite, granite, sandstone) are common erratics in the glacial tills in Clay County near the Nebo Hill site. The areas south of Clay County and the Missouri River including Jackson County do not contain outcrops of such rocks

or glacial erratics. In order for the inhabitants of the Little Blue drainage to process plant foods intensively, they would either have to have made concerted efforts to obtain the glacial erratics from north of the river or have to have relied on supplemental raw materials for the purpose of grinding and crushing seeds. Since glacial erratics do not have high frequencies in Little Blue drainage artifact assemblages it does not appear that procurement of these tools from areas north of the river was extensively developed.

Ground stone tools such as manos and metates which may be inferred to represent plant food processing implements may represent only a single facet of the technology involved in plant food processing. One explanation for their conspicuous visibility in the archaeological record is their tendency to be preserved along with other lithic raw materials. Unfortunately, wooden and bone implements are not preserved well in most cultural deposits in the Little Blue drainage. These may have been intensively used at Turner-Casey. Consequently, rather than discounting the importance of plant food preparation at Turner-Casey, on the basis of only one mano and metate, it is more prudent to suggest that its importance cannot be accurately assessed due to the vagaries of differential preservation factors and distribution of specific raw material categories.

Tables 104 and 105 list the activities inferred from the artifact inventories from Areas A and C. The percent of each function or activity indicates similar proportions in both areas for light and heavy-duty cutting and scraping, digging and plant food processing implements. Significant differences might be indicated for hunting, pigment processing and stone working where discrepancies range from 4.28-6.31 percent. In order to determine if these differences are significant the inferred activities as represented by the artifact totals from Areas A and C were subjected to a X^2 test for proportional equality. The null hypothesis in this case is that there is no statistical significance in the distribution of artifact categories or cultural activities between Areas A and C.

Table 106 indicates that the calculate X^2 statistic of 19.18 exceeds the theoretical distribution of equal proportions by about .68 points. The difference is border-line and perhaps negligible. Most of the major subsistence related activities are in close agreement according to the percentages in Tables 104 and 105 as well as for observed and expected frequencies in Table 106. During the calculation of X^2 statistic in Table 106, it is noted that the greatest cell frequencies in that summation occurs for "pigment processing" in both Areas A and C.

It is not presently known how relevant hematite grinding is to the determination of site function. Does that activity stand with equal importance as butchering tasks, stone tools production or plant food processing? Another consideration is the measurement of the frequency of ground hematite. In the inventory tables ground hematite is counted as number of pieces. By weight, however, the two specimens from Area A weigh a little more than all 13 pieces from Area C. Therefore, on the basis of sampling procedure and the uncertainty regarding this category the X^2 statistic for the two areas was recalculated omitting the category "pigment processing". As seen in Table 107 the X^2 statistic (6.13) drops considerably below the critical level of 16.75. Based on this information it appears that there is no significant difference

Table 104. Frequencies of inferred activities from lithic tools from Area A of Turner-Casey.

INFERRED FUNCTION	1*	2*	3*	4*	5*	6*	7*	8*	TOTAL	PERCENT OF TOTAL
Light duty cutting & scraping	6		185						191	65.41
Heavy duty cutting & scraping		17							17	5.82
Hunting	42								42	14.38
Plantfood processing					1				1	.34
Digging		1							1	.34
Pigment processing						2			2	.68
Stone working				9			8	21	38	13.01
TOTAL	48	18	185	9	1	2	8	21	292	99.98

*1. Light duty points
*2. Heavy duty bifaces
*3. Unifacial tools
*4. Ground chert
*5. Ground stone
*6. Minerals
*7. Cores
*8. Chunks

Table 105. Frequencies of inferred activities of lithic tools from Area B of Turner-Casey.

INFERRED FUNCTION	1*	2*	3*	4*	5*	6*	7*	8*	TOTAL	PERCENT OF TOTAL
Light duty cutting & scraping	1		140						141	68.44
Heavy duty cutting & scraping		15							15	7.28
Hunting	17								17	8.25
Plant food processing					1				1	.48
Digging		1							1	.48
Pigment processing						13			13	6.31
Stone working							11	7	18	8.73
TOTAL	18	16	140		1	13	11	7	206	99.97

*1. Light duty points
*2. Heavy duty bifaces
*3. Unifacial tools
*4. Ground chert
*5. Ground stone
*6. Minerals
*7. Cores
*8. Chunks

Table 106. Chi-squared determination for the significance of the distribution of inferred activities in Areas A and B at Turner-Casey.

INFERRED ACTIVITY	OBSERVED FREQUENCY* (fo)	EXPECTED FREQUENCY (fe)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{(fe)}$
AREA A				
Light-duty cutting/scraping	191	194.55	12.6	.064
Heavy-duty cutting/scraping	17	18.75	3.06	.16
Hunting	42	34.57	55.2	1.59
Plantfood processing	1	1.17	.028	.02
Digging	1	1.17	.028	.02
Pigment processing	2	3.8	46.2	5.25
Stone-working	38	32.81	26.9	.81
AREA B				
Light duty cutting/scraping	141	137.11	15.1	.11
Heavy-duty cutting/scraping	15	13.21	3.2	.24
Hunting	17	24.36	54.1	2.22
Plantfood processing	1	.82	.032	.04
Digging	1	.82	.032	.04
Pigment processing	13	6.19	46.37	7.49
Stone working	18	23.12	26.21	1.13
				X^2=19.18 D.F.=6 alpha=.005 $P(X^2)$=18.5

*Observed frequencies are the frequencies of artifacts which represent a given activity in Tables 103 and 104.

Table 107. Chi-squared determination for the significance of the distribution of inferred activities in Area A and B at Turner-Casey. "Pigment processing" is omitted.

INFERRED ACTIVITY	OBSERVED FREQUENCY* (fo)	EXPECTED FREQUENCY (fe)	$(fo-fe)^2$	$\frac{(fo-fe)^2}{(fe)}$
AREA A				
Light-duty cutting/scraping	191	199.2	67.24	.33
Heavy-duty cutting/scraping	17	19.2	4.84	.25
Hunting	42	35.4	43.66	1.23
Plantfood processing	1	1.2	.04	.03
Digging	1	1.2	.04	.03
Stone-working	38	33.6	19.36	.57
AREA B				
Light-duty cutting/scraping	141	132.46	72.93	.55
Heavy-duty cutting/scraping	15	12.76	5.01	.39
Hunting	17	23.54	42.77	1.81
Plantfood processing	1	.798	.04	.05
Digging	1	.798	.04	.05
Stone working	18	22.34	18.83	.84
				X^2=6.13
				D.F.=5
				alpha=.005
				$P(X^2)$=16.75

*Observed frequencies are the frequencies of artifacts which represent a given activity in Tables 103 and 104.

between Areas A and C in terms of the activities inferred from the lithic assemblage.

Chronology of the Nebo Hill Phase

Shippee (1948, 1964) originally proposed an Early Archaic date for the Nebo Hill complex. This was primarily based on typological comparisons with sites on the High Plains, such as the Long site in Angostura Lake, South Dakota, where lanceolate Angostura points had been dated at 7073 to 7715 B.P. (Wheeler 1959). Chapman (1975:200) notes the similarities between the Nebo Hill and Sedalia complexes. He suggests that since the Nebo Hill comple· is related to the Sedalia complex it may have been contemporaneous with it during the early part of the Late Archaic period.

Recent excavations at the Nebo Hill site (23CL11) have produced a date 3555±65 B.P. (Reid 1980). The date was on carbonized nut shells from a shallow pit and is considered to have been directly associated with the Nebo Hill occupation of the site. A second and more recent date of 2970±490 B.P. was obtained from a small sample of charred nuts from the Sohn site (Reeder 1980:63). This date has a large standard deviation and the actual time of occupation could have been much earlier. With the date of 4550±115 from Turner-Casey, three dates spanning an approximately 1500 year interval from 3000-4500 are available. Additionally, radiocarbon dates from the Cold Clay site (Schmits and Reust: this volume) should be considered. Spatially and temporally this site falls within the Nebo Hill era. However, two of the three points from the site are notched or stemmed rather than lanceolate. The lanceolate point falls within the range of variability of Nebo Hill point assemblages. C-14 dates from the Cold Clay site are 4540±150 and 4180±95 B.P.

A number of dates from Archaic complexes in eastern Kansas and central Missouri which contain lanceolate points are also useful in assessing the chronological position of the Nebo Hill phase. Two biconvex lanceolate points identical to Nebo Hill points were recovered from Horizon III-8 at the Coffey site on the Big Blue River drainage in northeastern Kansas. The mean of several radiocarbon dates from this horizon is 5270 B.P. The predominant points from Unit III at Coffey are notched forms with lenticular cross-sections. The cultural unit represented in Unit III has been identified as the Black Vermillion phase (Schmits 1981a). A second Black Vermillion phase site, located a short distance from Coffey, is De Shazer Creek (14MH39). A thick Archaic midden at this site has produced several biconvex lanceolate points comparable to Nebo Hill points. A date on charcoal from the midden is 4215±180 B.P.

The Williamson site, located on a small tributary of the Neosho River in east central Kansas (Schmits 1980b), has produced an El Dorado phase component which contains a number of lanceolate Late Archaic points. While these points are similar to Nebo Hill points, they have slightly greater width/length ratios and lack the robust biconvex cross-section of Nebo Hill points from western Missouri or the lanceolates from the Black Vermillion phase sites.

As noted, the Nebo Hill phase shares many traits with Archaic sites to the east and southeast which have been assigned to the Sedalia complex

(phase). Dates on Sedalia phase occupation at Phillips Spring along the Pomme de Terre drainage of southwest Missouri range from 3000-4000 B.P. (Kay 1979).

In summary, radiocarbon dates from Late Archaic sites in eastern Kansas and western Missouri with lanceolate points range from 3000-5200 B.P. Dates from sites with narrow strongly biconvex points cluster from about 5200-3500 B.P. Sites with somewhat broader and less robustly biconvex points may have slightly later dates. Based on these data it would appear that the Kansas City area Nebo Hill phase sites occupying a chronological position from approximately 3500-4500 B.P.

Settlement-Subsistence Patterns

The earliest recognized Nebo Hill sites were those located on upland bluffs and ridges north of the Missouri River in Clay and Ray Counties (Shippee 1948). More recently Martin (1976:64) has recognized a dichotomous presence of both large upland sites and small lowland floodplain sites. Based primarily on physiographic and meteorological considerations Reid (1980:217) has suggested a Nebo Hill settlement system consisting of upland warm-weather group aggregation at upland sites and cold weather dispersal to sheltered lowlands. Reid suggests that the Nebo Hill economy was based on the faunal and undomesticated floral resources of the Missouri flood plain, the tributary valleys, and slopes and summits of the adjoining river hills. The upland warm weather phase would have focused on the fall nut harvest and deer hunting season.

Reeder (1980:64-65) has proposed a similar settlement pattern model for the Nebo Hill phase consisting of warm weather use of the uplands and winter use of the lowlands. He cites exposure to harsh weather, a decrease in the amount of available water and a decline in upland deer populations during the winter - factors which would have made it difficult to support large groups of people in the uplands during winter. He suggests that occupation of the lowland areas would be more advantageous during the winter. He suggests that the duration of winter occupations may have been shorter with frequent movement allowing exploitation of large sections of the lowland environment.

If Reid and Reeder's model is correct, Turner-Casey would represent a warm weather occupation by a sizable group of people such as a number of kin groups. There is, however, meager direct substantive data to test this hypothesis. No identifiable faunal remains and limited floral remains were recovered from the site. The floral remains, though limited in sample size, point toward occupation of the site in the fall which would be compatible with Reid's model. The hickory nut, acorns, walnuts and grapes recovered from the site would be available principally from September through October. However, this information would not preclude earlier occupation of the site during the spring and summer or late during the winter, or even year round occupation.

Reid considers the high density of material and large size of the upland Nebo Hill site to indicate repeated seasonal use of the same area over a long period of time. While evidence of midden stains is not present at Turner-Casey, probably as a result of erosion, an extremely concentrated midden is present at the site especially in Area A. The amount of debris present at the

site is evidence of either (1) repeated use of the same area on a seasonal basis or (2) long term year round occupation of the same area. While the Reid-Reeder model may be an entirely plausible interpretation of Nebo Hill settlement-subsistence patterns, alternative explanations need to be considered and evaluated against presently available evidence and revised as additional evidence becomes available.

Lithic Procurement and Production Strategies

The study of procurement and production strategies is one that can be applied to a broader interest involving the movements of materials and personnel (logistics) and the relationships between populations and resources (Foley 1977:169). Before delineating the logistics of procurement it is necessary to understand the influence of the raw materials abundance, proximity and physical properties. With this knowledge it is then possible to outline strategies which may have been responsible for the chipped-stone tools and by-products present in the assemblage.

As noted in the preceding section, the sample of chipped stone artifacts from 23JA35 is firmly based on the reduction of Winterset cherts. Winterset is the most abundantly exposed chert in the Little Blue River drainage in Jackson County, Missouri. It is found in Winterset limestone, a Pennsylvanian rock which occurs in the Bronson Subgroup of the Kansas City Group. In the Blue Springs Lake areas and adjacent drainages, Winterset limestone outcrops between 850 ft and 900 ft above mean sea level. It lies directly above the Bethany Falls limestone, a conspicuous outcrop which forms the escarpment walls of the Little Blue Valley. Surveys indicate that at these locations Winterset chert occurs near the ground surface and can be recognized by unconsolidated surficial deposits of rubble. One such outcrop utilized aboriginally is 23JA184, located about 730 m northwest of 23JA35, or about a 15 minute walk. The site consists of weathered chert and limestone rubble as well as flakes and chunks indicative of human alteration. It is also possible to expose fresh chert with only minimal removal of soil. A digging stick or scuffing with the heel is sufficient to reveal the material which is buried less than 20 cm.

Winterset chert occurs as tabular chunks, slabs (tabloids) and tabular blocks which ranges in color from light to very dark gray and very pale brown. These forms are abundant with veins, vugs and of bright white calcite lamina (Reid 1978:58). The inclusions are usually weaker than the chert itself and contribute heavily to its breakage patterns. The blocks and slabs cleave readily along the inclusions, either by natural weathering processes or human alteration. The resulting pieces are often carried down slope and deposited in permanent and intermittent streams. Thus, secondary stream-laid deposits of chert are present in the Little Blue drainage. Seasonal availability of the chert is relatively unconstrained for chipped-stone artisans. One possible limitation may be the effect of ground freezing during the coldest winter months, usually January and February. This could be overcome, however, by relying on stockpiles.

For Winterset based chipped-stone industries the selection of good quality chert suitable for tool production requires the reduction and examina-

tion of natural chunks, tabloids and tabular blocks. The latter form is the largest and is usually comprised of two or more tabloids and a series of irregular-sized chunks joined by weak cleavage planes. A blow delivered to the block detaches these smaller forms which are then available for inspection of internal quality by removing cortical flakes. The process can reveal additional flaws, at which point the artisan may discard the piece or retain it for further reduction. Most likely, the evaluation and selection process is inherent in all stages of tool production since unseen flaws may reveal themselves at any time as the stone is further reduced. At the natural deposit or quarry selection and evaluation would be held foremost in the mind of the artisan.

Probably, the initial stages of raw material procurement required a trek to chert outcrops which occur on nearby hillslopes. At the quarry, raw chert was pried out of the ground and evaluated for its suitability. A small number of tabloids was carried back to the site without being tested for internal homogeneity. As noted in the previous section they appeared to be good pieces of chert. These may represent a raw material stockpile. Tabloids are probably the blank form from which most of the tools and by products were reduced. As such they are representative of the first stages of tool production. Since chipped stone tool production is a strictly reductive art one can propose a general model of tool production based on the simple logic that larger artifacts cannot be made from smaller artifacts (Katz 1976; Wright 1980). The raw tabloid yields tabular cores, heavy duty bifacial tools and light duty bifacial tools. Conceivably, each successively smaller form could have once possessed the characteristics of a larger form. For example, the heavy duty bifacial tool may represent an unfinished version of a lanceolate point; the point may represent a parent form of a convex, tapering edge drill. The tabular core could be an antecedent to the heavy duty bifacial tool.

The implications of this proposal can be evaluated with the data from the previous section. If the tabloids were stockpiled parents to tabular cores, then they should be larger. The supporting evidence for this implication is mostly positive, although based on very small samples. The range of tabloids lengths from Turner-Casey is from 82 mm to 105 mm. Only one of the complete tabular cores exceeds the tabloid's upper limit and 58.3 percent fall under the lower limit. The range of tabloid widths is from 58 mm - 95 mm. None of the tabular cores is wider than 95 mm and 58.3 percent are smaller than 58 mm. The range of tabloid thickness is 16 mm - 43 mm. None of the cores are as thin as the lower limit of the tabloids, which is considerably outside the trends of tabular core thickness ($\bar{X}=33.3 \pm 10.3$ mm). Thus, among the tabloids one appears to be excessively thin for use as a core.

As noted in the preceding section complete tabular cores are perhaps the most ambiguous series of artifacts. It is difficult to pin down their status in the reduction sequence and their intended uses. These artifacts were abandoned prior to use since none show evidence of wear patterns. Reid (1978:121) suggests that production rejects may occur when improper flaking techniques are employed, especially those which result in short, marginally placed scars. One of the consequences is that the artifact assumes a relatively thick angular cross-section with striking platforms that are unsuitable for further bifacial thinning. Another indication of their reject status is that they are generally shorter than the complete heavy duty bifacial tools.

Broken tabular cores and chunks, all which exhibit internal material flaws, indicate that much of the raw material carried back to the site was unsuitable. The rationale for this behavior may rest in the proximity of the raw chert. Given the short distance to the nearest Winterset outcrop the artisans may have elected to carry back loads of chert which were minimally tested for quality. Thus, in the case of industry at 23JA35, there is presently no clear distinction between quarry and home-work shop activities, other than the actual removal of chert from the ground.

The complete heavy duty bifacial tools represent different stages of the reduction sequence since they vary in size and degree of workmanship. Two of them very much resemble some of the tabular cores in size, outine and cross-section but are distinguished by areas of secondary retouch and crushed edges. Another two are as large as the tabular cores but exhibit a high degree of symmetry, no cortical surfaces and well prepared biclinal edges. Two smaller tools exhibit good bilateral symmetry but lack a regular cross-section. Two other tools are elongate, non-cortical with irregular primary flake removal and placement of secondary retouch. One is a sub-ovate form. It is probable that the larger tools were directly reduced from tabloids. For the smaller, it is unclear if they represent considerable bifacial reduction of a tabloid or whether large flakes served as the blank form.

Of the 21 heavy-duty distal fragments almost half possess smooth fracture planes. This is a definite contrast to the fracture conditions of tabular cores and chunks, all of which exhibited internal flaws. The increase in smooth fractures is probably an indication that impact during use was responsible for the breakage.

Production of points from 23JA35 involved more complex strategies. It should first be noted that these tools are not so firmly based on the reduction of Winterset cherts. Out of all complete and fragmented specimens 27 percent (n=18) are non Winterset. Since Winterset accounts for practically all of the other products and debitage it can be assumed that the tools were made elsewhere or traded to the inhabitants at 23JA35. Also, points are so finely reduced that it is difficult to infer their blank types. The options, however, include serial reduction of tabloids and the reduction of large flake blanks. Reid suggests that the majority of the Westerville type (points) from Nebo Hill (23CL11) were derived from thick tabular flakes (1978:90). The production of thick tabular flakes is feasible in the dominant Westerville industry at that site. Westerville chert has fewer inclusion compared to Winterset and it also occurs as large slabs and blocks. It is suggested that the Winterset points from 23JA35 were derived variously from tabloid blanks and intentionally produce flake blanks. Experience with Winterset chert indicates that homogeneity is very unpredictable and flakes larger, especially thicker, than finished lanceolates are difficult to detach. In archaeological collections only one large Winterset flake was observed which had partial bifacial reduction prior to breakage and discard (Wright 1980a). Given this, it is likely that the choice of blanks for point production required both evaluation and selection of suitably proportioned raw tabloids and flakes.

Once the light-duty biface or point has been produced, that artifact may represent the parent or preform for a series of other light-duty tools. A utilization and reduction sequence has been recognized at Nebo Hill (Reid

1978) and within the industry at 23JA35 as evidenced by the drill-like forms described in the previous section.

The unifacial flake tools assemblage represents the largest single category of tools in the collection. As demonstrated in the preceding section it is indicated that they were selected primarily for their suitability as hand-held, cutting and scraping tools. There may have been some tendency to select the larger and more robust cortical flakes for scraping tasks. There is a very small index of intentionally retouched flakes. Thus production of flake tools was not specialized and formal industry as it is in later Woodland complexes.

Summary and Recommendations

The Turner-Casey site (23JA35) is a large upland Nebo Hill site overlooking the East Fork of the Little Blue River in Jackson County, Missouri. The site consists of a shallow deposit of cultural debris, primarily lithics, extending over an area of 50,000-60,000 sq m. At least two major concentrated areas of debris referred to as Area A and B are present at the site.

The lithic assemblage is characterized by light duty lanceolate projectile points and heavy duty bifacial cutting and scraping tools, although the most numerous tools consist of edge-modified flakes used for light duty cutting and scraping tasks. Two fiber tempered plain-surfaced sherds were recovered from Turner-Casey. These are comparable to those recovered from the Nebo Hill site (Reid 1980). The artifact assemblages from the two areas of the site indicate that similar activities took place in both Area A and C. Principal activities as inferred from the lithics consist of light duty cutting and scraping, heavy duty cutting and scraping and hunting tasks. No identifiable faunal remains and only minimal floral remains were recovered from the site. The floral remains indicate the utilization of hickory nuts, walnuts and acorns.

A radiocarbon date of 4550 ± 115 from Turner-Casey provides the earliest presently available date for the Nebo Hill phase and fiber tempered ceramics in the Kansas City area.

Construction plans under consideration by the U.S. Army Corps of Engineers call for use of the Turner-Casey site as one of the borrow areas for fill for construction of the Blue Springs Lake dam. This would result in total destruction of the site. While extensive excavations have been conducted at the site, these have sampled only a small percentage of the site area. Much remains to be known about the internal structure of large upland Nebo Hill sites. The recovery of carbonized nuts from the shallow pits (Feature 6) indicates that additional features might be present at the site which would produce additional information regarding Nebo Hill chronology and settlement-subsistence patterns. If plans for use of the site as dam fill proceed, we recommend (1) preservation of representative areas of the site, and (2) archaeological monitored mechanical stripping of areas of the site scheduled for destruction. The latter would permit the recovery of tools and features which might be uncovered by earth moving activities.

CHAPTER XV

CULTURAL ADAPTATION IN THE LITTLE BLUE RIVER VALLEY

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INTRODUCTION

Construction of Blue Springs and Longview Lakes along the Little Blue River in Jackson County, Missouri will profoundly affect the cultural resources of this area. The Little Blue River is presently one of the few remaining tributaries of the Missouri River in the Kansas City area which has not previously been disturbed by urban expansion and industrialization. The archaeological investigation, designed to mitigate the impact of construction of the two lakes on the cultural resources of the area involved the excavation and study of five archaeological sites and testing of 29 sites to determine their significance. The results of these investigations have been discussed in previous chapters of this report along with ancillary studies involving the geology and biotic resources of the Little Blue Valley.

The research design for the project delineated four major goals for the project: (1) refinement of the cultural chronology of the Little Blue drainage, (2) formulation of models of Late Archaic, Middle Woodland and May Brook phase settlement-subsistence patterns, (3) evaluation of the use of tropical cultigens by the prehistoric occupants of the area, and (4) determination of lithic resource utilization. This chapter summarizes the discussion of the geology and biotic resources of the Little Blue River, discusses Late Archaic, Middle Woodland and May Brook phase settlement-subsistence patterns, evaluates the role of tropical cultigens in the prehistory of the region, documents lithic procurement practices, and summarizes recommendations for future management of cultural resources in the Blue Springs and Longview project areas.

GEOLOGY AND BIOTIC RESOURCES

The Little Blue River is a small tributary valley of the Missouri River incised into Pennsylvanian age shales and limestones. The valley is approximately 27 km in length and drains an area of roughly 673 square km. The valley walls are steep and covered with a regolith of weathered unconsolidated bedrock. The upper margins of the valley walls are frequently marked by outcrops of Bethany Falls limestone, a resistant unit up to three meters in thickness. Weathering under the Bethany Falls limestone often forms overhangs

suitable as shelters. The upland bluffs overlooking the Little Blue River consist of heavily dissected ridges separated by ravines and intermittent streams leading to the Little Blue River. Interfluvial areas are rolling and generally covered by a thick mantle of Pleistocene loess.

Based on Kopsick's research (this volume) the flood plains of the East Fork and main stem of the Little Blue River principally consist of two surfaces referred to as the T-0 and T-1 terraces. The T-0 has a narrow, slightly elevated surface closely paralleling the modern channel. The major area of the flood plain consists of the T-1 terrace which is elevated 4-5 meters above the present channel. The T-1 surface shows extensive evidence of past meandering evidenced by abandoned channels and oxbow lakes. Many of these relict channel positions presently consist of depressional wetland areas.

Radiocarbon dates and typological dates from archaeological sites indicate that the surface of the T-1 terrace dates from about 500 B.C. to A.D. 1. A radiocarbon date near the base of the terrace fill is 8060±90 B.P. Dates from mid-section of the T-1 terrace fill range from 4120-4550 B.P. Incision of the channel forming the T-0 terrace is thought to have begun just after A.D. 1. Radiocarbon dates from T-0 deposits indicate that aggradation of the T-0 occurred as late as the 12th century A.D. and probably continued until historic times.

The previously discussed geomorphic surfaces correlate well with soil types. Soils formed on the surficial deposits of the Little Blue basin include the Sibley soil formed on the upland loess and the Snead soil on hillside bedrock and weathered regolith. The Bremmer soil extends over well-drained areas of the T-1 terrace. The Zook and Colo soils are formed on T-1 wet depressional areas. The soil principally found on T-0 surfaces is the Kennebec soil.

The underlying bedrock of the Little Blue Valley contains abundant lithic resources for the manufacture of chipped stone tools. The most commonly available chert occurs in blue-gray and tan varieties within the Winterset limestone which outcrops just above the Bethany Falls limestone. The uplands and hillslopes bordering the Little Blue River contain numerous areas of locally concentrated chert outcropping in the form of weathered regoliths. Two other limestones, the Argentine and Westerville, outcrop near the study area and contain chert. The nearest chert bearing deposits of Westerville limestone are to the north in Clay County. Limited exposures of Argentine chert are present just south of the Longview Lake area.

The underlying geological structure and the climate are the two major variables maintaining the grassland and deciduous forest biotic communities of the area. Basically, the vegetation of the Little Blue area is transitional between the temperate grasslands to the north and west and the deciduous forest biomes to the southeast; this transition is characterized by extensive edge environments. Based on the 19th century General Land Office surveys and modern ecological surveys, Jurney (this volume) has defined six major biotic communities for the area. These include the upland prairie, the slope-upland forest, the barrens, the flood plain forest, the lowland prairie, and aquatic areas.

During the mid-19th century the upland prairie zone comprised approximately 24 percent of the area and contained faunal resources such as bison, wapiti, and prairie chicken. Floral resources included tubers, shoots, and seeds. The slope-upland forest comprised 34 percent of the drainage area and was characterized by xeric-adapted plants on hillside slopes and upland divides. Tree species were dominated by mast producing species such as white and black oak, pin oak, walnut, and hickory. Primary plant foods available in this community include fruits, berries, acorns, hickory nuts and walnuts. Major faunal resources include deer, squirrel, cottontail, raccoon and turkey.

The flood plain forest consisted of a narrow zone of woodland paralleling the Little Blue River. Extensive stands of flood plain forest also would have been present along the flood plain of the Missouri River. Typical tree species present in the flood plain forest include willow, elm, hackberry, walnut, maple, locust and sycamore. Shrubs include dogwood, coralberry, wild plum, gooseberry, black raspberry, blackberry, and greenbriar. Floodplain plant foods include rhizomes, shoots, tubers, stems, seeds, fruit and nuts. Faunal resources include deer, turkey, squirrel, cottontail and raccoon. Lowland prairie areas were dominated by grasses such as big bluestem, prairie cordgrass and switchgrass. Large numbers of herbaceous plants, especially weedy plant seed producing species such as chenopods, amaranths and ragweed were present in areas disturbed by silting. Faunal resources include deer, bison, wapiti, cottontail and quail.

The aquatic community consisted of hydric-adapted plants in and along the main channel and abandoned oxbow lakes of the Little Blue River and along the Missouri River. Aquatic plant resources included shoots, tubers, leaves, and stems. Faunal resources include fish, mussels, turtles and frogs. Migratory waterfowl were also present on a seasonal basis.

THE CULTURAL SEQUENCE OF THE LITTLE BLUE VALLEY

The cultural sequence for the Kansas City area known prior to the Little Blue Lakes project was summarized in Chapter III. Radiocarbon dated occupations for five cultural-historical periods were present: Late Archaic (ca. 3000-1000 B.C.), Early Woodland (ca. 500 B.C.-A.D. 1), Middle Woodland (ca. A.D. 1-500), Late Woodland (ca. 500-1000), and Mississippian (ca. A.D. 900-1700). In addition to sites confirmed by absolute dating, several of the occupations were tentatively assigned to a broader range of cultural-historical affiliations on the basis of artifact similarities. The results of the Little Blue Lakes investigations permit a refined cultural-historical sequence for the region.

The Early Archaic period (7000-5000 B.C.) is known by the occurrence of a limited number of projectile points. Early Archaic occupation of 23JA160, 23JA161 and 23JA181 is indicated on the basis of surface finds of Dalton and Graham Cave notched point fragments. Each of the sites are located on bluff-tops or upper elevations of bluff slopes. These upland locations may reflect short-term utilization of resources in the prairie/forest interface by groups engaged in hunting/foraging subsistence patterns involving procurement of

large intermediate, and small game, as well as a variety of plant resources.

In the Kansas City locality, the Early Archaic is somewhat less well understood than it is for other areas in the state of Missouri. One site in the Little Blue Lakes project area (23JA181) may still contain intact deposits dating to the Early Archaic. Further work at this site will better define the nature of the occupation, its material culture, subsistence base and temporal placement.

The Middle Archaic (5000-3000 B.C.) is still not well documented in the Little Blue drainage area. A combination of factors may account for the lack of substantial Early and Middle Archaic occupation of the area. Relatively old sites may have been located in valleys and may be deeply buried under alluvial deposits. More likely, the majority of these sites located in valleys have been scoured out by meandering prior to stabilization of the T-1 terrace surface approximately 2500 years ago. Secondly, since the projectile point typology for the Early and Middle Archaic is not well defined for the Midwest and eastern Plains, many surface finds of Archaic points cannot be referred to a specific portion of the period.

The Late Archaic (3000-1000 B.C.) is best represented by sites of the Nebo Hill phase. This complex was recently dated at the Nebo Hill site (23CL11) to 1605 B.C. In the Little Blue drainage there are currently two C-14 dated sites with Nebo Hill components. The Sohn site (23JA110) represents a short-term lowland occupation for the complex. The Nebo Hill component at Sohn has one late radiocarbon date of 1020±490 B.C.; however, its point assemblage is well within the variability for Nebo Hill points from other sites. The Sohn site illustrates one segment of the apparently dichotomous upland-lowland Nebo Hill settlement pattern, probably representing a cold weather occupation (Reeder 1980:65; Reid 1980:37).

Investigations at the Turner-Casey site (23JA35) indicate the presence of a large, upland Nebo Hill settlement. First thought to be contemporaneous with the Nebo Hill type site, Turner-Casey now appears to have been occupied 1000 years earlier than Nebo Hill (Table 108). It shares many characteristics with the Nebo Hill type site, including bluff top location, preponderance of Nebo Hill points, wide range of artifact categories, and fiber tempered ceramics. The Turner-Casey site currently represents the earliest western date on fiber tempered ceramics.

Another upland Nebo Hill phase site is 23JA170. Like the Nebo Hill and Turner-Casey sites, 23JA170 exhibits a variety of artifact classes, is dominated by a lanceolate point industry, and was a base camp for seasonally mobile aggregates. Unlike Nebo Hill and Turner-Casey, 23JA170 has a high index of non-local cherts in the point assemblages. The precise temporal relationship of this site to other Nebo Hill occupations cannot yet be assessed since datable materials were not recovered.

Table 108. Radiocarbon dates (in years B.P.) for human occupations in the Little Blue drainage, Jackson County, Missouri.

Cold Clay (23JA155)	23JA40
4540±150(DIC-1678)	2300±11 (UGa-2351)
4180± (DIC-1679)	1850±140 (UGa-2350)
Turner Casey (23HA35)	Black Belly (23JA238)
4550±115 (Beta-1873)	1620± (DIC-1680)
Sohn Site (23JA110)	Sperry (23JA85)
2970±490 (DIC-913)	1220±70 (UGa-1867)
2220±195 DIC-914	1145±60 (UGa1868)
1800±$255 (DIC-912)	1255±65 (UGa-1869)
1720±75 (DIC-911)	
Bowlin Bridge (23JA38)	23JA143
2440±90 B.P. (Beta-1326)	1620±70 (DIC-1683)
Traff Site (23JA159)	May Brook (23JA43)
2455±80 (UGa-2404)	780±90 (DIC-1522)
2345±70 (UGa-2535)	730±130 (DIC-1526)
23JA36	Seven Acres (23HA115)
2400±85 (UGa-1873)	705±55 (UGa-2353)
1520±170 (UGa-1874)	615±65 (UGa-2352)
1355±210 (UGa-1875)	

Seven other small sites in the Little Blue Lakes project area (23JA37, 23JA170, 23JA161, 23JA164, 23JA137, 23JA169, 23JA175, and 23JA177) yielded Nebo Hill points in small numbers. This may indicate an ancillary relationship of these sites to the larger upland base camps. However, the low frequencies of these points and the presence of other temporally ambiguous forms complicates interpretation of these sites.

The early occupation at Cold Clay (23JA155) is of special interest to the Late Archaic. Radiocarbon determinations indicate this buried component to be contemporaneous with the Nebo Hill occupation at Turner-Casey (Table 108). Although the assemblage is small, points present are not similar to those of the Nebo Hill complex. Another differing aspect of its lithic assemblage is the presence of ovate light-duty bifacial forms. The range of artifact types is also limited, and there is no evidence for a complete range of subsistence activities.

Presently, the extent of investigations and numbers of artifacts recovered from 23JA155 are too limited to decide between alternative hypotheses of the cultural relationship of this occupation to Nebo Hill sites such as Turner-Casey and 23JA170. First, despite the variation in projectile

points 23JA155 may represent a type of special-purpose, lowland activity camp forming a part of the Nebo Hill phase settlement pattern. Equally viable is the suggestion that Cold Clay represents a distinct, yet contemporary, Archaic complex. Further investigations have been recommended for Cold Clay since it probably contains the necessary additional data to decide between these alternatives.

For the Late Archaic, the Little Blue Lakes project has collected additional absolute dates which better indicate the antiquity of the Nebo Hill phase (ca. 2600-1000 B.C.). In addition, it is now suggested that the Nebo Hill phase may not have been the only cultural complex in the Kansas City area in the Late Archaic.

The Early Woodland period in the Kansas City area is considered to extend from 500 B.C.-A.D. 1. Prior to 1977 there were no good indicators of typical Early Woodland sites in the area. In 1977 the presence of a Black Sand ceramic rimsherd from the surface of site 23JA36 and an unassociated radiocarbon date of 450±85 B.C. (Table 108) suggested that such occupations existed. However, as late as 1979 the Late Archaic Nebo Hill complex was considered to be the direct antecedent of the Kansas City Hopewell or Middle Woodland period (Johnson 1979:90). Subsequent investigations revealed three more pre-Kansas City Hopewell components in the Little Blue drainage: 23JA40 (Brown and Ziegler 1979); Traff (23JA159) (Wright 1980); and Bowlin Bridge (23JA38). All four of these sites are streamside occupations with C-14 determinations between 500 B.C.-A.D. 1 (Table 108).

Only Traff (23JA159) appears to have been occupied with a relatively high degree of intensity. The block excavation there indicated that a variety of domestic activities took place including food preparation and consumption, use of ceramics and stone tools, and stone tool manufacture. Artifacts indicative of these activities were distributed primarily around the perimeter of a large open hearth. The range of artifact classes from the site indicates that it was occupied by a group containing both males and females on a frequent basis in late summer-fall (Wright 1980). Although the C-14 determinations from 23JA36 and 23JA40 date buried cultural deposits, they are not in direct association with culturally diagnostic artifacts such as points or ceramics. However, projectile points and ceramics from the more securely dated deposit at Traff are comparable to surface and buried finds at 23JA40 and 23JA36. These collections indicate that the Early Woodland chipped stone industry is characterized mainly by the production of subtriangular corner-notched and unnotched light duty points with minor representation of Langtry contracting-stemmed points. Ceramics, poorly represented in all components, are sand or grit tempered with diagonal cordmarking similar to Illinois Valley Morton complex wares (Brown and Ziegler 1979). These two artifact classes present distinct differences with those from Nebo Hill complex sites where light-duty points are lanceolate and ceramics are fiber tempered. The Early Woodland sites are further distinguished from succeeding early Kansas City Hopewell occupations where point traditions are comparable to the Illinois Valley broad-bladed and ovate Mankers and Snyders points (Heffner 1974; Montet-White 1968; Bell 1976; Wright 1980).

Although the present investigation at Bowlin Bridge did not recover diagnostic artifacts suitable for comparison with those from Traff, 23JA40, and 23JA36, its internal structure is comparable to 23JA40 and 23JA36. Each site appears to have been briefly occupied perhaps during the fall. Fire hearths are small but associated with common domestic tasks such as cooking and tool production or maintenance.

Outside of the Little Blue Lakes project area, Martin (1976:18-22) defines in the Fishing River drainage of Clay County, Missouri, a Langtry point complex affiliated with either the Late Archaic or Early Woodland period. The Langtry contracting stemmed point is currently one of the most temporally ubiquitous styles which, in its many variants, has been associated with components dating from ca. 6000 B.C. to A.D. 1200 (Bell 1958; Chapman 1980). Only in the Fishing River drainage has this point appeared at a given site as the dominant style in the Northwest Prairie Region. Unfortunately, Fishing River sites have not been radiocarbon dated. Martin establishes the temporal placement of the Langtry complex on the basis of co-occurrence of cordmarked sand/grit tempered ceramics. Since similar ceramics are well dated at Traff to about 500 B.C., Martin's Early Woodland/Late Archaic age for the Langtry complex on the Fishing River may be reasonable.

The local Middle Woodland period (A.D. 1-500) is best known by the Kansas City Hopewell occupations in Platte and Clay Counties. It is of particular interest that adjoining areas, such as the Little Blue drainage, be examined for evidence of temporally related cultural components. Fifteen sites in the Little Blue drainage area have artifact assemblages which exhibit similarities with other Middle Woodland assemblages. Four have yielded radiocarbon determinations which fall between the A.D. 1-500 sequence (Table 108): Sohn (23JA110) (Reeder 1978); 23JA36 (Brown and Ziegler 1979); Black Belly (23JA238) and 23JA143. 23JA40 yielded one C-14 date which places it on the borderline between Middle Woodland and Early Woodland (Table 108). Based on the date's standard deviation and similarities of the artifact assemblages to other dated Early Woodland sites, the site most likely reflects a late Early Woodland occupation (Brown and Ziegler 1979).

The Sohn site is a brief, streamside occupation on the Little Blue River. The Middle Woodland component is spatially separate from the Nebo Hill component and is characterized by a homogenous artifact assemblage. Light-duty point styles are exclusively subtriangular with expanding stems. This form is similar to styles dated to the middle of the Kansas City Hopewell sequence (ca. A.D. 250-350) from other sites. This is confirmed by an associated radiocarbon date of 240±75 B.C. (Reeder 1978:176). Ceramics from the Sohn site have plain surfaces, flared rims and grit or sand temper. Decoration occurs only on the lips as impressions. Lip forms are rounded or flat. On the basis of these attributes, the Sohn ceramics better resemble late Middle Woodland (A.D. 300-500) or Late Woodland (A.D. 500-900) rather than Classic Middle Woodland ceramic traditions (Reeder 1978:178).

Site 23JA36 is also a flood plain occupation on the Little Blue River. The Middle Woodland occupation may be one of several components including Early and Late Woodland. Radiocarbon determinations of 430±170 A.D. and 595±210 A.D. (Table 108) indicate that the occupation is late for local Middle

Woodland and is possibly transitional to Late Woodland. Culturally diagnostic artifacts consist of subtriangular Steuben points. The Steuben point type is especially characteristic of the mid to late years of the Kansas City Hopewell complex (ca. 300-500 B.C.).

The Middle Woodland component at the Black Belly site (23JA238) is dated to 330±45 A.D. (Table 108). It is also a stream side occupation on the East Fork of the Little Blue River. The radiocarbon date places it in the mid to late Middle Woodland. Point styles include subtriangular contracting stem forms similar to Burkett, Dickson, or Langry points. Ceramics consist only of body sherds which are grit or sand tempered. Floral remains indicate that the site was probably occupied during the late summer-fall.

Site 23JA43 is located only 750 meters east of the Black Belly site on the banks of the East Fork of the Little Blue River. Its radiocarbon date of 330±70 B.C. indicates contemporaneity with Black Belly. Unfortunately no culturally diagnostic points were recovered. The limited ceramics from the site likewise provide little information regarding the ceramic traditions. All are plain body sherds with sand or grit temper. The site likely represents a brief occupation perhaps during late summer and fall.

Middle Woodland sites in the Little Blue drainage reflect a diversity of artifact associations and internal site structure that was only partially elucidated by investigation of the Kansas City Hopewell sites in Platte and Clay Counties. The Sohn site (23JA110) is similar to the ancillary camp as identified by Johnson (1976). It exhibits a limited range of artifact taxa, but the internal structure of the site indicates some intensity of occupation in the form of trash pits and the presence of possible post-hole stains. However, the co-occurrence of middle Kansas City Hopewell points with either late Kansas City Hopewell or Late Woodland ceramics indicates some deviation from sites north of the Missouri River. At Black Belly (23JA238) the dominant point is the contracting stem form known variously as a Burkett, Dickson, or Langtry point. As noted above, this form is known to be present in Late Archaic and Early Woodland assemblages. Contracting stemmed point assemblages are usually not characteristic of Middle Woodland components. At 23JA36 the contracting stem point may be associated with the late years of the Middle Woodland or with the Late Woodland period.

Sites 23JA143, Black Belly and 23JA36 do not yet exhibit structural features such as trash pits and post-hole stains. They may represent less intensive occupations than the Middle Woodland occupation at Sohn. In addition, none of the dated Little Blue drainage sites (including Sohn) demonstrates the parallel changes in ceramic and chipped-stone traditions noted for the classic Kansas City Hopewell occupations. In view of this, Middle Woodland sites along the Little Blue exhibit some degree of difference from Middle Woodland sites located north of the Missouri River. This is perhaps to be expected given the recent indications that the Kansas City Hopewell complex of this period intruded into an existing population that had traditions not so strongly influenced by more easterly complexes. Middle Woodland sites along the Little Blue River may represent indigenous populations in the area rather than special activity sites associated with the Kansas City Hopewell sites.

The Late Woodland (A.D. 500-900) is the least understood era of the Woodland period in the Little Blue Lakes project area as well as in the Kansas City area. At the present, only the Sperry site (23JA85) is firmly assigned to this period (Table 108). Radiocarbon dates indicate that it was occupied at approximately A.D. 745±50 (Brown and Ziegler 1979:5) by a small social group during the fall and/or winter. Subsistence remains indicate a hunter-gatherer foraging strategy with no evidence of horticulture or agriculture (O'Malley 1979:108). Ceramics are predominantly tempered with crushed granite and sherd. Most sherds have plain surfaces, although a small frequency of cordmarked surfaces is also present. For the Brush Creek drainage in Platte County, the Late Woodland is thought to be represented at a number of sites discovered during surface reconnaissance. According to Johnson (1974) these occupations are small dispersed sites characterized by the presence of thick cordmarked pottery and small corner-notched points.

Small points are the dominant form for the Late Woodland and succeeding periods. They are also represented in small numbers during the Late Archaic and Middle Woodland and, given their size and weight, probably represent arrow tips. The selection of the small form as the dominant point indicates increased reliance on bow and arrow technology. This technological shift from large to small points was apparently not based on changes in subsistence strategies since the resource base for the region probably does not significantly change from about 1600 B.C. to A.D. 1300. Technological change independent of economic factors is also suggested for the chipped stone industry of the Middle Woodland period in the Midwest and in the Kansas City locality (Montet-White 1968:180; Bell 1976:55, Wright 1979).

Although 13 possible Late Woodland components were located during the Little Blue Lakes test investigation, none of these appear to be occupations of great intensity, and no additional C-14 determinations are available to confirm this affiliation. In spite of the limited data base, a field of inquiry for future research can be specified. Johnson (1974) assigned sites with thick cordmarked sherds to the Late Woodland period in Platte County. As noted above, however, sherds from the Sperry site (A.D. 745) were predominantly plain. To further complicate the ceramic sequence, plain sherds which more closely resemble local Late Woodland pottery occur in the Middle Woodland occupation at the Sohn site at approximately A.D. 240 (Reeder 1978:178). This information suggests that the Late Woodland in the Kansas City locality may be marked by at least two ceramic traditions which differ, as far as can be presently determined, by either plain or cordmarked pottery.

The Mississippian period in the Kansas City area is principally marked by the Steed-Kisker phase sites centered on the Platte River drainage north of the Missouri River (Chapman 1980:158). Settlements were located on tops of bluffs overlooking the Missouri River and its tributaries and on the flood plains of tributary streams. Houses consisted of rectangular wattle and daub structures with four central posts. Distinctive artifacts include shell tempered incised and plain pottery and small triangular arrow points. Based on radiocarbon dates, the Steed-Kisker occupation ranges from A.D. 1000-1200. The economy was principally centered on the growing of domesticated cultigens, gathering of wild plants, and the hunting of large and small mammals. The most logical explanation for the presence of the Mississippian Steed-Kisker sites is by migration by colonizers from St. Louis and Cahokia Center.

More recently, a second Mississippian period cultural unit, referred to as the May Brook phase, has been defined in the Kansas City area (Brown 1979; Schmits 1980). This complex is centered along the Little Blue Valley and is best known on the basis of excavations at the Seven Acre site (23JA115) and the May Brook site (23JA43). May Brook phase sites are characterized by an artifact assemblage consisting of cordmarked and plain surfaces, sherd and shell tempered ceramics, and triangular notched and unnotched arrow points. The sites consist of short term, seasonally occupied extractive camps located on the flood plains of the Little Blue River and its tributaries. Radiocarbon dates from these sites range from A.D. 1170 to A.D. 1335 indicating a chronological position centering in the 13th century A.D. Tool manufacture and extractive tasks such as deer hunting and processing and wild seed procurement were the major activities which took place at these sites (Schmits 1980:65-66).

May Brook phase occupations are indicated at a number of sites investigated during the course of the Little Blue Lakes project. Cordmarked, shell tempered and plain sherd tempered ceramics along with a small arrow point were recovered from Bike Track Shelter (23JA9). A thick, buried May Brook phase midden was located at Black Belly (23JA238). This deposit (Unit B) has been radiocarbon dated at A.D. 1270. Diagnostic artifacts include small notched and unnotched arrow points and cordmarked, sherd and shell tempered ceramics. Based on lithic artifacts, cutting was the predominant activity that took place in the May Brook component at Black Belly. Other activities include hunting and scraping. A third site with a May Brook phase component is Bowlin Bridge (23JA38). Data recovered from the site indicate the presence of a brief occupation centered near Features 4 and 5. Floral remains from this feature indicate the utilization of wild seeds such as ammania. Faunal remains indicate the use of bison.

In summary the Little Blue Lakes project has provided further information concerning the cultural sequence of the Little Blue Valley. The Early Archaic period is represented by an occasional Early Archaic point type such as Dalton and Graham Cave side-notched on upland sites. Middle Archaic sites have not been located, and it is suggested that occupaton of the area during this period was limited. Furthermore, such sites were probably located on the flood plain and may have been scoured out. They may also be represented by notched and stemmed points from upland sites which at the present cannot be assigned to a specific chronological position.

The Late Archaic is well represented by a number of Nebo Hill phase sites and by the Cold Clay site. Based on radiocarbon dates, the Late Archaic in the Little Blue Valley ranges from as early as 4550 B.P. at Turner-Casey and at Cold Clay to as late as 2970 B.P. at Sohn. The Early Woodland period extends from approximately 500 B.C. to A.D. 1 and is characterized by a number of small sites located on the T-1 terrace of the Little Blue River. The most extensively investigated Early Woodland site is the Traff site (23JA159). The artifact assemblage from Traff is characterized by an artifact assemblage including subtriangular corner-notched and un-notched projectile points and a smaller number of contracting stemmed points. Middle Woodland sites in the Little Blue Valley appear to represent a continuation of the local Woodland tradition rather than segments of the Kansas City Hopewell settlement pattern.

The most extensively investigated Middle Woodland site is the Sohn site. Other important sites are Black Belly (23JA238) and 23JA143.

While a number of the sites investigated in the course of the Little Blue project may have Late Woodland components, all of these are light and have produced little substantive information. The best known Late Woodland site is the Sperry site (23JA85), which is characterized by plain grit tempered ceramics and small corner-notched Scallorn points. Mississippian period occupation of the area is marked by the local May Brook phase. Relatively little evidence of Mississippian Steed-Kisker occupations of the Little Blue Valley has been encountered.

SETTLEMENT AND SUBSISTENCE PATTERNS

The following discussion focuses on delineation of settlement-subsistence practices for the Archaic, Woodland, and Mississippian periods in the Little Blue Valley locality. Emphasis is on the Late Archaic, Middle Woodland and May Brook phase of the Mississippian period since our data are better for these periods.

The internal characteristics of individual Late Archaic sites are examined in order to establish ranges of subsistence related practices. Topographic settings and the seasonality of site occupation are discussed in order to delineate settlement-subsistence strategies for hunter-gatherers. The Middle Woodland, best known north of the Missouri River by the Kansas City Hopewell complex, is examined for its range of settlement types and various aspects of its food resource base. Implications for hunter-gatherer strategies discussed for the Late Archaic are applied to the Middle Woodland occupation as a means to explain its variety of settlement types. The recently defined May Brook phase is distinct from the contemporaneous Steed-Kisker phase in that there is little evidence of a high degree of sedentism or the use of horticulture. Since the May Brook phase contrasts with what is generally known for the Mississippian period, attention is given to May Brook phase subsistence and settlement patterns, and relationships with other sites in Kansas and Missouri.

Late Archaic

Currently there are four Late Archaic habitation components in the Kansas City locality which have been radiocarbon dated. The difference in their ages spans at least 1000 years. Three sites, Nebo Hill (Reid 1978), Turner-Casey (23JA35) and 23JA170 are situated on bluff-tops in Clay and Jackson Counties. Sohn (Reeder 1978) and Cold Clay are lowland occupations in Jackson County. The Sohn site is located on the first terrace of the Little Blue River and Cold Clay is in the first terrace near the headwaters of the East Fork of the Little Blue River.

The earliest recognized Nebo Hill sites were those located on upland bluffs and ridges north of the Missouri River in Clay and Ray Counties

(Shippee 1948). More recently Martin (1976:64) has recognized the presence of both large upland sites and small lowland flood plain sites. Based primarily on physiographic and meteorological considerations, Reid (1980:217) has suggested a Nebo Hill settlement system consisting of upland warm-weather group aggregation at upland sites and cold weather dispersal to sheltered lowlands. Reid suggests that the Nebo Hill economy was based on faunal and undomesticated floral resources of the Missouri flood plain, the tributary valleys, and slopes and summits of the adjoining uplands. The upland warm weather phase is hypothesized to have been focused on the fall nut harvest and deer hunting season.

Reeder (1980:64-65) has proposed a similar settlement pattern model for the Nebo Hill complex consisting of warm weather use of the uplands and winter use of the lowlands. He cites exposure to harsh weather, a decrease in the amount of available water and a decline in upland deer populations as factors which would have made it difficult to support large groups of people in the uplands during winter. He suggests that occupation of the lowland areas would be more advantageous during the winter and that the duration of winter occupations may have been shorter with frequent movement. This would have allowed for exploitation of large sections of the lowland environment.

If Reid and Reeder's model is correct the upland Nebo Hill sites along the Little Blue such as Turner-Casey and 23JA170, represent warm weather occupations by a sizable group of people, perhaps a number of kin groups. There is, however, meager direct substantive data with which to test this hypothesis. Limited faunal and floral remains have been recovered from these sites. The hickory nut, acorns, walnuts and grapes recovered from Turner-Casey would be available principally from September through October suggesting occupation during this period. However, this information would not preclude earlier occupation of the site during the spring and summer, later during the winter, or even year round.

Reid considers the high density of material and large size of the Nebo Hill site (23CL11) to indicate repeated seasonal use of the same area over a long period of time. While evidence of midden stains are not present at Turner-Casey and 23JA170, probably as a result of erosion, an extremely concentrated midden is present at both sites, and is evidence of either (1) repeated use of the same area on a seasonal basis or (2) long term year round occupation of the same area.

The Nebo Hill site was the first dated and well documented Nebo Hill complex occupation. From the bifacial and ground stone tool inventory Reid recognized six macro-functional categories of tools which indicated the following activities at the site: hunting, plant food processing, digging, chipped stone tool manufacture, woodworking and mineral working (Reid 1978). The site also contained a large sample of utilized flakes which we consider to indicate light-duty cutting and scraping tools. Estimates of their frequencies clearly establish them as the dominant tool form at Nebo Hill. Characteristic of the Nebo Hill site, then, is its size which is indicative of repeated occupation.

According to Reid the data recovered from the Main Block excavation at Nebo Hill indicates the presence of a sexually-mixed group of approximately five families. This estimate is based on the presence of five manos and five hearths (one of each per family). The cultural deposit intersected by the Main Block probably represents an isolated camping episode. On the basis of meteorological constraints, Reid suggests that this occupation occurred during the warmer seasons of the year. The sample of artifacts recovered from the excavation at Nebo Hill represents only a small portion of the estimated site area and consequently inferences from this data may not give us an accurate picture of the prehistoric demography of Nebo Hill.

The habitation characteristic of the Turner-Casey site have been discussed in detail in preceding chapters. It should be noted that subsistence-related activities at Turner-Casey are comparable to those at Nebo Hill. Other similarities between these two sites include the large areal extent of habitation debris on a similar topographic setting and stylistic similarities between heavy and light-duty bifacial tools. The limited area of Turner-Casey which has been excavated precludes a reliable demographic estimate. The lack of preserved floral and faunal data likewise precludes empirical determination of the season of occupation.

Discrepancies among specific tool-type frequencies can be noted between Turner-Casey and Nebo Hill, particularly among ground-stone tools. Nebo Hill has a higher frequency of these implements consisting of pre-shaped and use-modified manos, metates, abraders and axes made from local Clay County glacial erratics. This difference may be explained by differential availability of these raw materials. Also, the functional equivalents for Turner-Casey industries may have been made of perishable materials. Apparently, the effort to procure materials by occupants of Turner-Casey from resources near Nebo Hill was not intensive. This conclusion is supported by the raw materials represented in the chipped-stone industry where the overwhelming majority of tools and debitage are derived from primary and secondary sources of the Little Blue drainage.

Site 23JA170 is a blufftop site similar to Nebo Hill and Turner-Casey. Although it has not been dated radiometrically, its point and bifacial tool assemblage clearly indicate affiliation with the Nebo Hill complex. Like other Little Blue drainage Late Archaic sites, 23JA170 is characterized by a large number of light and heavy-duty cutting and scraping tools, chipping debris and a small number of groundstone manos and metates. Preservation of organic material is extremely poor and no cultural features were located. Although 23JA170 is a blufftop site it does not appear to be as large as the Nebo Hill or Turner-Casey sites. However, the amount of lithic debris and tools is large, indicating intensive occupation.

The assemblage of the lowland Nebo Hill occupation at the Sohn site is comparable with Nebo Hill, Turner-Casey and 23JA170 in terms of subsistence-related activities. However, when relative frequencies are examined there are differences among tool types. Although Sohn is considered to be a small, cold weather occupation its proportion of heavy-duty cutting and scraping tools is greater than that found at Turner-Casey. Also, the number of manos at Sohn is equal to the number found at Nebo Hill.

These differences are pointed out because Sohn, Nebo Hill, Turner-Casey and 23JA170 clearly represent components of the Nebo Hill settlement system. Since the number of such Nebo Hill occupations in the Little Blue drainage is small, it is important that the implications and interpretations of quantative differences be approached with care. Yellen (1977) cautions us to consider the problems of contrasting large and small settlements. Assessing subsistence-related activities may not be as difficult, but making demographic estimates from debris frequencies is complex. For example, Reid has used the number of manos recovered at Nebo Hill to estimate the number of families responsible for the residue in the Main Block area. If the same reasoning is applied to the Sohn assemblage, then similar sized groups may have been responsible for its residue.

The activities inferred from the Cold Clay assemblage also exhibit characteristics of larger sites such as Turner-Casey and Sohn. There is a relatively high frequency of light-duty cutting and scraping tools and a strong index of heavy-duty cutting and scraping tools. Plant food processing at 23JA155 is indicated by the single mano and metate. These ground-stone tools are associated with female-specific tasks. Likewise, the hunting points indicate male tasks (Cook 1972:11, Gould 1968:119; Peterson 1976:568). This interpretation suggests that the Late Archaic component at Cold Clay included a sexually mixed group of occupants. Further evidence for a complete range of cultural activities comes from the chipped-stone assemblage. All stages of the reduction sequences are well represented. Proportionately, the frequencies of cores and chunks are much higher than at the Turner-Casey site. Also present are raw tabloids, bifacial blanks, flake tools, finished points and flake debitage. The nearby Winterset chert regolith may have been an important determinant in the selection of the setting for Cold Clay. Likewise, the proximity of the raw material may have an influence on the high frequency of initial reduction stage debris.

Determinants for the scheduling of hunter-gatherer seasonal rounds are varied. The influences of resource abundance on aggregation and dispersal are environmentally and socially specific. For example, Western Desert aborigines tend to congregrate in large groups only after periods of good rains have established plentiful stands of water. Due to the lack of permanent water, this is the only time they can afford to commune and enjoy adequate water. By contrast, the !Kung hunter-gatherers choose a reverse strategy. Seasons of abundance are marked by group dispersals. The proliferation of vegetable foods and concentrations of game at new waterholes make it advantageous for small groups to relocate and exploit these resources. At the same time, a varied, if not nutritionally complete, diet is desirable, and groups will devote additional energy to move a camp to satisfy this fancy (Yellen 1977: 53,65).

After the rainy season the distribution of food resources diminishes for the !Kung. At this point aggregation is necessary and, perhaps, unavoidable. According to Yellen (1977:69) the reason for this is that the greater number of people engaged in hunting and gathering activites results in a higher rate of success. A larger group can obtain a more complete picture of available resources. When small numbers of individuals go out in different directions each day, they not only gather food, but they also collect incidental information on the location of point resources. The greater the number of such

groups, the more extensive is the knowledge of the different resources available likely to be, and overall hunting and gathering efficiency may increase. Thus a large group may mean a variety of both meat and plant foods.

The reason we dwell on these two subsistence strategies is two-fold. First, it serves to illustrate that two hunting and gathering cultures which are similar in many ways respond variously to variable environments. It also indicates that there is a weak correlation between social grouping and resource availability. These considerations bear implications for settlement-subsistence studies of the Late Archaic in Kansas City, especially in terms of settlement locations and seasonality of site occupation.

Reid (1980) and Reeder (1980) suggest a topographic and seasonal dichotomy for Nebo Hill complex habitation sites: (1) large base camps are established on blufftops during warm weather for the purpose of relatively large communal harvests; (2) smaller encampments are established in the stream valleys during the winter in order to escape the harsh, cold conditions of the blufftops and to ameliorate the effects of diminished resources during winter. The argument for this pattern is based on meteorological parameters, resource distribution and demography.

Meteorological parameters may provide support for the hypothesis that the bluff top locations represent only warm weather occupations. Although no comparisons have been made for wind strength and chill factors, it is intuitively reasonable that a hilltop, lacking wind breaks, would be less comfortable for a winter campsite than a valley bottom location. However, it should be considered that the bluffs bordering the Little Blue River were probably wooded in the prehistoric past. These woods may have provided wind breaks permitting occupation of bluffs in colder seasons.

While meteorological parameters provide some support for occupation of the uplands during warmer months, these same parameters are less precise when evaluating the seasonality of lowland occupations, since occupation of the lowlands would be permitted during both warm and cold seasons. Actually occupation of the lowlands would be unfavorable only during periods of intense rainfall. Occupation of the lowlands during both warm and cold seasons is evidenced by settlement patterns of the post-Late Archaic period cultures in the Little Blue drainage which are concentrated almost entirely in the lowlands.

The biotic resources of the Kansas City locality are components of the mixed prairie/oak-hickory forest. This mosaic pattern offers a great amount of edge environments and consequently greater species diversity. The mosaic quality of the distribution of major food sources makes it difficult to infer resource utilization from site location since these resources are geographically ubiquitous. In the Little Blue Valley the location of a site does not present important subsistence-related advantages in terms of exploited resources, as indicated in the subsistence remains from archaeological sites. Although the geographic distribution of food resources may not show a clear-cut influence on settlement patterns, their seasonal availiability probably did. It is assumed that food sources diminished during winter, but as indicated above, there is more than one way to organize the distribution of groups in order to make the most out of reduced concentrations of food. Two of these

alternatives are dispersal and aggregation. The first is posited by Reeder (1980) and is seen ethnographically among the Western Desert Aborigines of Australia (Gould 1969). Dispersal depends on the success of small groups to collect adequate resources without the pressure of a large number of mouths to feed. The second alternative, aggregation, is ethnographically described by Yellen (1977) and is a "safety in numbers" strategy that depends upon the combined intelligence and efforts of many people to locate and process adequate supplies. The reasons for any given choice of group size are complex and, as suggested by Yellen (1977), hinge on preferences and group perception or demography.

Our present understanding of Late Archaic demography is limited. Too few habitation sites have been excavated and only a small percentage of the site area has been opened at the sites which have been investigated. We have no evidence of the size of house structure nor the composition of cemeteries. Other indicators of groups size or composition could be considered, but these are of limited reliability. For example, Reid (1978) considers the presence of five manos to suggest that five families (one mano per family) were responsible for the material culture in Nebo Hill's block excavation. However, in the Nebo Hill occupation at Sohn an equal number of manos were recovered. It is proposed, however, that Sohn is a small winter encampment for dispersed groups. While this does not necessarily obviate proposed estimates of site size, it does point to the hazard of interpreting site function beyond a delineation of subsistence related activites. It is likely that among the stratigraphically deflated upland sites in the Kansas City area it will be difficult to distinguish the remains of multiple brief occupations from one another or to recognize scavenging behavior for lithic tools (e.g., manos).

A summary of the above considerations indicates that: (1) Hunter-gatherers are not restricted to dispersal as a response to diminished resources. Aggregation provides equally viable opportunities for obtaining adequate resources. (2) Topographical and meteorological variables are not strong determinants for site location, particularly for lowland occupations. (3) Late Archaic sites along the Little Blue River and in the Kansas City area in general have not yet produced data which permit reliable estimates of the demographic and social conditions which influence seasonal movements of hunter-gatherers. The implications of these factors have had considerable influence on our present understanding of local Late Archaic settlement patterns. In the absence of organic evidence for site seasonality, we see no limits on occupation at any time of the year, except perhaps during the flood season (spring-early summer)for the lowland sites such as Sohn and Cold Clay.

The intensity of occupation at the lowland sites is considered to be less than that at Turner-Casey, Nebo Hill, and 23JA170, and it follows that smaller groups occupied these locales. However, group size by itself is not sufficient evidence to indicate a cold or warm weather occupation. These upland and lowland settlements may represent a dispersal pattern present during periods of abundance.

Most arguments for Late Archaic settlement patterns are based upon circumstantial reasoning including the alternative set forth above. When one strategy is promoted over another in this fashion, it becomes increasingly possible to reify this settlement pattern as it is integrated into an overall

picture of Late Archaic adaptation for the Kansas City area. The veracity of this model should be supported by empirically derived sets of information including a larger sample of occupations and specific types of biotic data necessary for seasonality inferences. While the Reid-Reeder model is a plausible interpretation of Nebo Hill settlement-subsistence patterns, alternative explanations need to be considered and evaluated with subsequent revision as additional evidence becomes available.

Middle Woodland Period

The local Middle Woodland period (A.D. 1-500), also known as the Kansas City Hopewell complex, was the most thoroughly investigated period in the Kansas City locality until the mid-1970's. As early as 1938, Wedel published a report on this western extension of the Hopewellian tradition which was better known in the Illinois Valley and southwestern Wisconsin (Wedel 1943). Since then intensive programs have investigated Hopewell sites including large villages, smaller camp sites and burial mounds. In the Kansas City area Hopewell sites are located primarily in Platte and Clay Counties north of Kansas City. Kansas City Hopewell components have been recorded as far south as Miami County, Kansas at 14MM26 and to the north in Doniphan County, Kansas at the Kelley site, 14DP11 (Katz 1969). A western expression of the Kansas City Hopewell is seen near Manhattan, Kansas, about 161 km west of Kansas City (Johnson 1979:87).

In terms of excavations and reportage, Hopewell sites in the immediate Kansas City area have received the greatest attention. Efforts to document and understand the Kansas City Hopewell were undertaken at a time when virtually no data were available for occupations immediately preceding or following the A.D. 1-500 period. Until recently it has been suggested that Kansas City Hopewell was immediately preceded by the Late Archaic Nebo Hill complex since no Early Woodland occupations had been recorded at the time (Johnson 1979:86-90). The introduction of Hopewellian culture to the area was thought to result from westward migration of Illinois Valley based peoples via the Missouri River corridor. But, as indicated by data recently acquired from the Little Blue River drainage in Jackson County, Missouri, the Early Woodland period (500 B.C.-A.D. 1) is well represented and is distinct from the local Late Archaic and Kansas City Hopewell (Wright 1980:78). At the present, it appears that Kansas City Hopewell peoples migrated westward into an area occupied by indigenous Early Woodland populations.

Kansas City Hopewell Middle Woodland has been examined in terms of its settlement patterns. Johnson (1976) describes the distribution of large Hopewell villages and small ancillary camps in the Kansas City locality for areas north of the Missouri River in Platte County. Large occupations are located on tributaries of the Missouri River at the point where the smaller streams break from the bluff line to enter the Missouri flood plain. Small camps were located upstream in tributary valleys. The smaller upstream camps exhibited both similarities in ceramic styles and a limited range of artifact types and inferred activities in comparison to larger villages located downstream. It was suggested that the smaller upstream camps had an ancillary and special-purpose relationship with the larger villages in that the former were established as a response to population increases and the need to expand hunting

and gathering territories (Johnson 1976:8-15). These hunting and gathering practices focused on exploitation of the Missouri River flood plain forest and prairie, tributary forests, slope and upland oak-hickory forests and the upland prairie. The primary reliance was on forest community resources (Johnson 1979).

A different perspective on the Kansas City Hopewell settlement patterns has recently been proposed by Reid (1980). He argues that the establishment of large permanent Hopewellian villages near the flood plain was not a response to the subsistence-related advantages of that environment. He states that although the flooplain would offer tracts of land suitable for horticulture, there is no evidence for dietary reliance on these domestic products. Nor are there indications that increased dependence on fish or waterfowl are correlated with the establishment of these villages. Rather, he suggests that the distribution of large settlements may be influenced by social and economic factors involving the manipulation of people and goods by means of riverine modes (Reid 1980:37-42). He suggests that the riverine orientaton of the smaller ancillary camps is better explained in terms of logistics as opposed to subsistence (Reid 1980:41).

The Kansas City Hopewell settlement pattern models put forth by Johnson and Reid can be evaluated in part by the data recovered from the Blue Springs and Longview Lakes projects. Four of the sites tested, Mouse Creek (23JA104), Black Belly (23JA238), 23JA143, and 23JA112, contain Middle Woodland C-14 determinations or culturally diagnostic artifacts. Sites having tentative affiliations with the Middle Woodland or Kansas City Hopewell recorded during this project are 23JA109, 23JA9, 23JA161 and 23JA137.

Site 23JA143 yielded Middle Woodland ceramics and a C-14 determination of A.D. 330$\pm$70, placing it relatively late in the Middle Woodland sequence. The Black Belly site (23JA238) yielded contracting-stem Langtry points and grit and sand tempered ceramic body sherds. A radiocarbon date of A.D. 330$\pm$45 places its occupation during the same time as 23JA143. Both sites are located within 750 meters of each other on the north bank of the East Fork of the Little Blue River. Site 23JA112 is located on the east bank of the Little Blue River several kilometers upstream from 23JA238 and 23JA143. Point styles from 23JA112 resemble Steuben, Mankers Notched or Kings Corner Notched and Scallorn types. The co-occurrence of these styles has been noted at Trowbridge (14WY1) and is associated with the later portion of the Kansas City Hopewell sequence (Bell 1976:33-35; Johnson 1976:14). No radiocarbon dates were obtained from the deposit at 23JA112.

The Mouse Creek site (23JA104) is on the east bank of Mouse Creek, about 2.5 km south of its confluence with the Little Blue River. Ceramics and point styles are comparable to those of the middle to late Kansas City Hopewell period. The May Brook site (23JA43), located on May Brook, a small tributary of the Little Blue River, is best noted for its buried Mississippian component (Schmits 1980). However, it contains a surficial Middle Woodland deposit that includes Mankers corner-notched, Stueben and Langtry-like contracting stemmed points and grit and sand tempered ceramics.

The Seven Acres site (23JA115) has a surface Middle Woodland or Kansas City Hopewell component. The site is located on the T-1 terrace of the east

bank of the Little Blue River just west of May Brook (Brown 1979). The Sohn site (23JA110) also contains a buried Middle Woodland deposit which yielded radiocarbon dates of A.D. 150±150 and A.D. 240±75. Projectile point styles are predominantly expanding stemmed forms characteristic of the middle years of the Kansas City Hopewell sequence. The ceramics are plain-surfaced and more typical of late Kansas City Hopewell sherds (Reeder 1978:176-8). Investigations at the Traff site (23JA159) revealed a thin Middle Woodland component which was horizontally stratified from the Early Woodland occupaton. Site 23JA49 contained a surface deposit of Middle Woodland projectile points (Wright 1980).

In addition to their Middle Woodland cultural affiliations, these sites are all small encampments located on T-1 terrace settings with no evidence of intense occupation. The material culture from their occupations represents a small, portable set of implements suitable for procurement and processing of floral and faunal resources.

The individual location of each site deserves some consideration especially in view of Reid's argument that logistics (i.e., riverine navigation) is a strong factor in determining site location. The locations of 15 Middle Woodland sites are known for the Little Blue River drainage area, extending from just above the confluence with the Missouri River to about 35 km south of the headwater tributaries of the Little Blue River in Jackson County. All but one of the site locations are in the middle or upper reaches of the drainage. The channel of the middle and upper reaches of the Little Blue River and the entire course of the East Fork of the Little Blue River are narrow, (no more than 2 m in width), shallow, and hardly suitable for navigation. Sites 23JA112, 23JA104 and 23JA103 are located on the upper reaches of the Little Blue River in an area where the stream is shallow and flows over bedrock.

Although these site locations do not fit Reid's prediction, he accurately characterizes the subsistence bases as not reliant on riverine resources or horticulture. At none of these four encampments do we see evidence for a subsistence resource base which deviates from that established during the Late Archaic. Throughout the Middle Woodland, as well as preceding and subsequent periods, the subsistence economy was based on hunter-gatherer strategies. The success of this strategy was due to the occupants' ability to exploit the natural flora and fauna of a variety of habitats while living in large, permanent villages and temporarily occupied sites (Johnson 1976). Apparently this strategy was relatively stable for this locality since intensive horticulture or agriculture does not appear until protohistoric times. Although cultigens were known, their occurrence in the archaeological record is meager. This is probably the case for most Middle Woodland groups. To the east in the Illinois Valley, Ford (1979) considers cultigens to have had the same importance as ruderals (pigweed, goosefoot) in Middle Woodland diets. Corn and pigweed production require long harvest and preparation time. They are not particularly nutritional and they must be complemented with other plants (such as nuts) and meats in order to form an important element of the dietary base. If the use of cultigens played even a minor role in food production, it was probably in the form of small-scale gardening.

In the absence of horticulture or agriculture, the subsistence economy of Middle Woodland in the Little Blue drainage was based upon the natural productivity of the mixed prairie/oak-hickory forest. Necessary vegetable supplements to a ruderal and cultigen plant diet are mast products. Mast resource yields are highly susceptible to short-term environmental changes. A productive stand of mast trees one year might not be so productive the next. Thus, group mobility is a necessary condition for those who depend on the land's natural products (Ford 1979:263-7). This also applies to mast-preferring animals such as deer, which are a staple of Middle Woodland diets. Therefore, the production of food was characterized by and contingent upon accessibility to a variety of hunting and gathering territories.

Pre-Middle Woodland settlements are characteristically short term and patterned by seasonal events. Evidence for permanent villages in the Little Blue drainage is scant. Currently there is nothing to indicate permanent year-round occupations for either the Late Archaic or Early Woodland periods. For the Late Archaic, settlements are considered to consist of upland warm weather and lowland cold weather camps (Reid 1980, Reeder 1980). Early Woodland occupations are located in Little Blue drainage valleys and include sites 23JA36, 23JA40 (Brown and Ziegler 1979), Traff (Wright 1980) and Bowlin Bridge (23JA38). There is no evidence of year-round permanency at these sites. The Middle Woodland is distinguished by the appearance of large, permanently aggregated Kansas City Hopewell villages at about A.D. 1 (Johnson 1976). This pattern has been recognized in Platte County, about 65 km to the north of the Little Blue drainage. Although the Middle Woodland occupation at the Sohn site (23JA110) contained trash pits and possible structures, it does not likely represent a year-round occupation.

As discussed above, Middle Woodland period assemblages in the Little Blue Valley do not conform to the traditions exhibited at the Platte County sites. This may be expected since the Hopewellian occupations may have intruded on the Kansas City locality from centers to the east in the lower Illinois River Valley (Wedel 1943; Johnson 1976). Therefore the presence of more than one cultural tradition in the Kansas City area during the Middle Woodland is possible. An additional implication of the intrusive nature of the Hopewell culture is its likely effect on local demography. The arrival of new groups would have resulted in a population increase, although the dimensions of this increase remain uncertain. This would have influenced local hunting-gathering territories. We know that the effect was not so extensive that it required alternative food production technologies or new types of resources. The probable response was in the form of manipulation of social groupings. One form of new organization may have been the development of aggregated Hopewellian villages.

At this point it is useful to refer to our discussion of Late Archaic settlement-subsistence strategies and to recall that settlement strategies in response to reduced resources are variable. The polarities are aggregation or dispersal. The benefits of aggregation, whether seasonal or permanent, are applicable to many circumstances. In the case of permanent Hopewell villages, group efforts are seen expanding the productivity of the hunting-gathering territory. Interestingly, Ford (1979:236) sees a similar situation in that increased numbers of children would have been desirable for nut and berry collection. The mobility that was once necessary is supplemented by the advantages of the several groups of people working cooperatively.

Continued re-occupation at the permanent villages surely taxes the good resource territory. A response to these diminished resources as Johnson (1976) sees it was an expansion of the populations to new areas. This is evidenced by the establishment of smaller upstream camps related typologically and temporally to the larger villages at about A.D. 250. The relationship of these smaller tributary villages to the larger more permanent villages may require re-examination. Nonetheless, the two settlement types illustrate complementary economic strategies--permanent aggregation later supplemented with dispersal.

For the Little Blue drainage, specific information regarding Middle Woodland settlement-subsistence patterns such as duration and season of occupation is limited. This is partly a result of the limited information recovered from sites 23JA104, 23JA112 and Bowlin Bridge (23JA38). The latter site turned out to have Early Woodland and May Brook phase components rather than a Middle Woodland component. Consequently, most of the available information concerning the Middle Wodland comes from the Sohn site and other sites which have not been intensively excavated. Secondarily, the problem is compounded by our lack of definiton of social units present within the Kansas City Hopewell or Middle Woodland in the Kansas City locality. While Kansas City Hopewell settlement patterns have been intensively studied, little attention has been paid to defining the social units or phases responsible for these settlements.

Consequently, at the present time it is most prudent to refrain from all but the most general statement regarding Middle Woodland settlement patterns in the Little Blue drainage. Based on the available evidence, it appears that Middle Woodland sites consist of thin, short-term occupations principally located on the T-1 terrace of the Little Blue River. What is clear is that these sites are limited to the flood plain. No evidence of Middle Woodland occupation has been found on the uplands. These sites may represent a variety of seasonal postures or may represent late summer and fall extractive camps associated with more intensively occupied villages outside the drainage. No intensively occupied permanent villages are known to be present along the Little Blue River. The relationship of these sites to other Middle Woodland sites north of the Missouri River is also ambigous. The Little Blue sites could represent ancillary villages associated with a more permanent and unknown village perhaps located near the Missouri River or on nearby adjacent drainages. However, as we have noted, Middle Woodland sites along the Little Blue have typological characteristics which distinguish them from Kansas City Hopewell sites. Consequently, we are likely dealing with a distinct Middle Woodland cultural tradition in the Little Blue Valley. This cultural system may have evolved from earlier local Early Woodland social groups. It may have a considerably less complex social organization than the Kansas City Hopewell Middle Woodland tradition. If this is the case, the dispersed short-term Middle Woodland settlements along the Little Blue may represent the full range of settlement types and seasonal postures associated with this culture.

What this discussion points out is the need for additional work on Middle Woodland sites in the area. Two of the most important sites that are relevant to a clarification of these problems and to defining the Middle Woodland in the Little Blue River in general are Black Belly (23JA238) and 23JA143. Test excavations at Black Belly indicate the presence of a thick concentrated

midden, features and preserved faunal and floral remains. This data would be sufficient to assess the nature of the site along with duration and season of occupancy at one Middle Woodland site. Intensive investigation of the relationship between Black Belly and nearby 23JA143 would clarify the nature of Middle Woodland settlement patterns in the region.

May Brook Phase

As we have noted, several sites investigated in the course of the Little Blue Lakes project have had components representative of the recently defined Mississippian period May Brook phase. The May Brook phase is best known on the basis of excavations at the Seven Acres site (23JA115) (Brown 1979) and the May Brook site (23JA43) (Schmits 1980). Seven Acres is located on the flood plain of the Little Blue River just west of the Blue Springs Lake project area (Fig. 1). The site includes a Middle Woodland component located on higher ground and the later Mississippian period component on lower ground near the Little Blue River. Brown (1979) has designated the Mississippian period component at Seven Acres as the May Brook phase.

A large block excavation opened at Seven Acres resulted in the recovery of features, ceramics, lithics and faunal and floral remains. Features included a basin-shaped hearth and a small trash filled storage pit. Lithic and ceramic artifacts from the site included plain and cordmarked, shell tempered, globular vessels with straight rims. Arrow points included notched and un-notched triangular points with single and double side notches and occasional single basal notches. Radiocarbon dates from Seven Acres are A.D. 1335±65 and A.D. 1245±55 (Brown 1979).

The May Brook site (23JA43) is a multi-component prehistoric occupation located in the valley of May Brook, a small tributary of the Little Blue River, near the Seven Acres site. The site contains Archaic, Middle Woodland and Mississippian period components located in a series of alluvial deposits referred to as Units I-IV (Schmits 1980).

The Mississippian period component was discovered in the spring of 1979 by the May Brook Interceptor Sewerline trenching operations. This component consists of a concentrated cultural stratum buried in T-0 alluvium. The cultural deposit was buried soon after the prehistoric occupation resulting in preservation of organic faunal and floral remains. The ceramic assemblage is small, consisting of sections of approximately five cordmarked and plain globular cooking vessels with straight or slightly flaring rims. There is an absence of decoration on both the plain and cordmarked ware. One plain surfaced vessel has a strap handle. The temper in these ceramics consists predominantly of ground sherd. Sand and shell temper are also present.

The lithic assemblage from May Brook is a set of specialized tools including small bifaces suitable for hafting as arrow points and flake tools designed for cutting and scraping tasks. Larger bifacial tools are infrequent, as are ground stone tools and minerals. The lithic assemblage indicates that the site represents an extractive camp focused on the manufacture and use of chipped stone tools for hunting, butchering and hide preparation.

The predominant raw material for chipped stone tools is the blue-gray Winterset chert available on the bluff approximately 250 meters to the east of the site. Imported white cherts available from Mississippian or Ordovician formations in central or south-central Missouri are present in small quantities, primarily in the form of finished tools and small resharpened flakes. The presence of a large number of Winterset cores and manufacturing debris at the site indicates that industrial activities took place at the site rather than at the chert outcrops. Systematic heat treatment of Winterset chert was not practiced. However, nearly half of the debitage and over half of the tools made from the non-local white cherts were heated.

Faunal remains from May Brook indicate that the primary prey of the May Brook occupants was the white-tailed deer. Of less importance were bison and a number of small mammals such as raccoon and cottontail. Carbonized seeds and nuts indicate the intensive harvesting of the seeds of wild annual herbaceous plants such as amaranths, ammania, chenopods and purslane. Ethnographic evidence suggests that these seeds were gathered in large numbers and intentionally parched or popped at the site. Mast resources such as acorns and hickory nuts were also utilized. Other plant resources such as smartweed, pondweed, dewberry, grapes, greenbriar, coneflower and black walnut may have been exploited to a lesser extent.

The restricted periods of availability for a large number of seeds and nuts indicate that May Brook was occupied during a period between August and October. Other kinds of evidence are consistent with this inference. The presence of a section of an Odocoileus cranial fragment with a fully developed antler is indicative of a September through December kill date. The location of the site on a rapidly aggrading flood plain of May Brook, which would have been subjected to inundation during periods of high rainfall, is indicative of occupation during the dry season. The months of lowest rainfall in the Little Blue River Valley are in the late summer and fall.

The similarities between the faunal and floral assemblages from May Brook and Seven Acres are striking. According to Brown (1979) the faunal assemblage from Seven Acres indicates the presence of five deer and one individual each of bison, raccoon, cottontail, shrew, vole and mole. The faunal inventory of Seven Acres is nearly identical to that recovered from May Brook, both in terms of the species present and the number of individuals of each species represented. Five deer and one bison are represented at each site. Two raccoon are present at May Brook and one at Seven Acres.

The floral assemblage from Seven Acres includes nuts from five species of trees and 34 taxa of carbonized seeds (Brown 1979). Three species of nuts including hickory, black walnut and oak account for nearly all of the nut remains. Most of the carbonized seeds occur in small frequencies and are from species which could grow in the immediate vicinity of the site or in disturbed areas such as human settlements. Brown infers that most of these seeds were either accidently introduced to the site or were accidently carbonized. Brown also suggests that the major plant resource exploited by the occupants of Seven Acres was the mast resource. Based primarily on the carbonized nuts and seeds Brown suggests that Seven Acres was occupied during the late summer or early fall. Evidence of cultigens at Seven Acres is limited to two fragments

of corn (Zea mays). No evidence of squash (Cucurbita) or beans (Phaseolus) was encountered.

A mano was also recovered from Seven Acres suggesting that the processing of seeds may have occurred at the site. Upon examination of the carbonized seeds from Seven Acres, it was found that five species have high frequencies of occurrence (30-91 specimens): pennycress, pink, foxtail, purslane and bedstraw. Species which were common at May Brook, such as amaranths and chenopods, are also present in small numbers at Seven Acres. A number of plants of the cress family were eaten by aboriginal Americans (Yanovsky 1937: 27), and as previously noted, there is considerable ethnographic documentation for the use of purslane, amaranths and chenopods. It is highly probable that some of these species were utilized by the prehistoric residents of Seven Acres.

As we have noted, May Brook phase occupations are present at Black Belly (23JA238), Bowlin Bridge (23JA38) and Bike Track Shelter (23JA9). Black Belly and Bowlin Bridge appear to be similar to Seven Acres and May Brook. They are located in lowland depressional areas and would be suitable for habitation during periods of low rainfall such as late summer, fall and possibly winter. Faunal and floral remains from Bowlin Bridge indicate the exploitation of bison and wild seeds such as ammannia. Although the carbonized seed assemblage from Black Belly is limited, ammannia, purslane, greenbriar seeds and hickory nuts are represented. Bike Track Shelter represents a previously unreported May Brook phase settlement type. Faunal remains from Bike Track Shelter include deer, small mammals and birds. Floral remains include a single hickory nut and walnut shells. While the sample of faunal and flora remains from the shelter is limited and association of these materials with the May Brook phase component is uncertain, it is likely that the site represents a hunting camp occupied for a brief duration by a small social group.

Based on the excavations at Seven Acres, May Brook, Black Belly, Bowlin Bridge and Bike Track Shelter, the May Brook phase is characterized by an artifact assemblage consisting of cordmarked and plain surfaced sherd and shell tempered ceramics and triangular notched and unnotched arrow points. The sites consist of short-term, seasonally occupied campsites principally located on low-lying Kennebec soils of the T-0 flood plain of the Little Blue River and its tributaries. Radiocarbon dates from these sites range from A.D. 1170 to A.D. 1335, indicating a chronological position centered in the 13th century A.D. Tool manufacture and extractive tasks, such as deer hunting and processing and wild seed procurement, were the major activities which took place at these sites. The sites lack evidence of permanent architectural features typical of mor permanent settlements. Because of their principal location on the flood plain and vulnerability to inundation during the wet season, they would not have been suitable for use on a year round basis.

One conspicuous feature of the May Brook phase sites is the lack of tropical cultigens which have been recovered from a number of sites in the Plains and Plains border region. Despite the extensive flotation of matrix samples only minimal evidence of tropical cultigens has been recovered from the Seven Acres site and Bowlin Bridge sites. No evidence was recovered from the other May Brook phase sites.

The hunter-gatherer settlement-subsistence pattern of the May Brook phase contrasts with what is generally known about the Mississippian period. More permanent villages or hamlets with fairly substantial architectural remains and a subsistence pattern involving horticulture would have been expected. The information from May Book and Seven Acres indicates that the May Brook phase sites represent one segment of a broader settlement-subsistence pattern similar to that postulated for the earlier Middle Woodland Kansas City Hopewell complex. The May Brook phase sites represent ancillary extractive camps associated with more permanent settlements. A likely location for more permanent base camps would be the higher Bremmer soils on the T-1 terraces of the Little Blue River and its tributaries. However, there is little evidence to indicate that such sites exist. Extensive areas of the Little Blue River drainage have been examined for cultural resources in the past few years as a result of various federally funded projects (Klippel 1967; Heffner 1974; Reid 1975; Heffner and Martin 1976; Brown 1977; Feagins 1976). As a result, large number of sites have been located and tested, and a number have been excavated. However, only a few of these appear to have May Brook phase components.

The best known Mississippian period occupation in the Kansas City area is the Mississippian Steed-Kisker complex centered on the Platte River drainage north of the Missouri River (Fig. 1). A second complex in the Kansas City area related to the May Brook phase is represented by sites on the Fishing River drainage and assigned to the Middle Ceramic period by Martin (1976). The Fishing River is located north of the Missouri River, just a short distance northeast of the Little Blue River drainage (Fig. 1). The Middle Ceramic sites are located on the flood plain and talus slopes of the Fishing River and the Missouri. Based on surface evidence, Martin interprets these sites as representing villages and hunting camps. The village sites have debris scatters from one to 2.4 ha in extent, indicating larger settlements and daub scatters are present which suggest the presence of structures. Campsites are smaller and have only a thin scatter of debris.

Artifacts from Fishing River Middle Ceramic sites include shell tempered plain and cordmarked ceramics. There is minimal occurrence of incised decoration suggestive of Mississippian influences or origins. The plain pottery has low recurved lips and occasionally strap handles similar to the specimen recovered from May Brook. The cordmarked ceramics and arrow points are similar to those from May Brook and Seven Acres. Based on site locations, artifact inventory and analogy with Steed-Kisker, Martin (1976) suggests an economy based on hunting, gathering and horticulture. The artifacts from the Middle Ceramic sites in the Fishing River are almost identical to those of the May Brook phase, suggesting that those two groups of sites represent closely related or perhaps identical cultural units. Further investigation of the Fishing River sites will be required to clarify this relationship. Based on presently available evidence it appears that Mississippian May Brook phase use of the Little Blue Valley was on a seasonal rather than year round basis and that more permanent villages were located in adjacent areas.

AGRICULTURE AND TROPICAL CULTIGENS

Human populations are noted to be characteristcally conservative in maintaining adaptive behaviors which have proved successful (Cohen 1977). The hunter-gatherer way of life has been perhaps the most sucessful and persistent adaptation man has ever achieved for subsistence (Lee and DeVore 1968:3). This form of subsistence strategy has dominated man's history for about 99 percent of his existence. However, the adoption of agriculture has had a revolutionary impact on man's way of life and is viewed as the very foundation of higher forms of civilization (Watson and Watson 1971). While there are many theories addressing the causes of this major change in subsistence strategy, the theoretical implications of the causes have had an equally important impact on understanding prehistoric man's adaptations. The potential changes in the population density, the degree of sedentism and the division of labor are significant aspects of this understanding.

A sedentary, or at least semi-sedentary lifestyle, is a requirement for an economy based on food production since agricultural crops need to be planted, cared for and harvested at specific times of the year. Sedentism often involves a greater reliance on stored foods and a corresponding increase in storage facilities. In addition, groups begin to live in closer proximity to their trash accumulations for longer periods of time. Both storage pits and trash piles are prime habitats for rodents which are prolific breeders and carriers of a number of bacteria and intestinal parasites harmful to man. Many of these pathogens had not affected prehistoric man prior to a sedentary lifestyle. In addition to the introduction of new diseases, several older known strains of diseases became more prevalent. Diseases such as measles and smallpox can survive in epidemic proportions given a large number of hosts in a stationary environment.

A sedentary lifestyle also affects the division of labor and the amount of physical stress endured by women. In a nomadic environment, adult women usually are responible for gathering 50 percent of the required food, for raising and caring for the children, and for transporting the family possessions to a new living site when the group moves (Lee 1968). With sedentism, the latter responsibility becomes less frequent and may disappear entirely. In addition, while the woman may still be required to gather half of the food, the distance she must travel to do so greatly decreases. These changes produce a decrease in the physical burden of the woman's economic responsibilities.

The significance of a lighter work load and less distance traveled is one of several factors involved in the potential for a resultant increase in population. A low fertility rate among nomadic groups is not only preferred but may be regulated by biological processes involving the woman's economic and social lifestyle and her nutritional standards. This hypothesis (Firsch 1974,1978) states that a critical proportion of height to weight (or a critical level of fat) is biologically necessary for a woman to conceive. This

critical fat level is significantly depleted by pregnancy, birth of the child, and subsequent care of the child. A heavy work load involving periodic movement of the camp in conjunction with long lactation periods of three to four years, effectively retards the restoration of the necessary fat deposits following the birth of a child. This restriction results in long intervals between births, which in turn checks population growth. These biological mechanisms change with the development of sedentism and may result in a higher fertility rate by increasing female fecundity. A higher fertility rate may also be preferred among sedentary, farming communities as economically beneficial since agriculture is labor intensive (Dumond 1975). Nutrition is an important factor as a biological constraint of fecundity. In the past it has been assumed that nomadic hunters and gatherers were continually faced with fluctuating levels of resource availability resulting in periodic famine and starvation. Consequently, adoption of agriculture allowed for an immediate increase in food supply, better nutrition and a more stable year round diet (Sussman 1972). However, recent research indicates that nutritional imbalance has increased with a sedentary and agricultural lifestyle (Stini 1975).

Asch and Asch (1978) and Schmitt (1979) have demonstrated the high nutritrional quality of native flora consumed by prehistoric populations. Foods such as nuts, sunflower (Helianthus sp.) and sumpweed (Iva annua) have been shown to offer the most desirable protein sources next to animal protein. However, with agriculturally based sedentism there is a marked increase in the use of cereals and starches at the expense of animal protein. In addition, critical vitamins such as vitamin C, thiamin and vitamin A, are very susceptible to damage in food processing, a practice more common in sedentary agricultural communities. It has been suggested that a high reliance on agricultural foods, especially corn, contributes to a chronic iron deficiency (Lallo et. al 1977; El-Najjar and Robertson 1976). In addition to being low in iron, corn contains phytate, which binds and consequently reduces the amount of iron that is available in the biological system. These dietary deficiencies would increase an individual's susceptibility to disease (Weinberg 1977).

The transition from nomadic hunting and gathering to sedentary agriculture certainly involved more than the above discussion. While many of the complicated and often synergistic mechanisms involved are only now being identified, one important variable has become quite clear. The adoption of subsistence agriculture was a gradual, non-catastrophic process that occurred over decades, even centuries. Man first used domesticates as additives to his diet. As gradual changes in the procurement system took place, resources which were once insignificant became dominant and agriculture flourished. However gradual this adoption may have been, the implications of the transition remain significant. An increase in sedentism instigated an introduction and persistence of diseases, it allowed the potential for an increase in population resulting from increased fecundity, and resulted in an overall decline in the nutritional level. These changes were gradual and cumulative so much so that they may not have been readily identifiable to prehistoric populations and were certainly not viewed as detrimental or inferior to the preceding hunting and gathering economy.

Despite the evidence which suggests that agriculture may have been a less desired form of subsistence, many indigenous populations had adopted agriculture by the time of European contact. However, some groups occupying portions of the Central Plains either maintained their hunting and gathering strategies or partially abandoned their agricultural fields for hunting following the introduction of the horse. A review of the available evidence concerning the presence of tropical and native cultigens and the adoption of agriculture by prehistoric occupants of the eastern Plains includes the following species: corn (Zea mays), beans (Phaseolus sp.), squash (Cucurbita sp.), gourd (Lagenaria sicerarie), sunflower (Helianthus anuus), goosefoot (Chenopodium sp.) and sumpweed (Iva annua).

The earliest evidence for the use of cultigens comes from the Phillip Spring site in the Missouri Ozarks, consisting of squash and gourd seeds, and dated at 4280±50 B.P. (Kay 1980). A second discovery of cultigens in the Ozark region was made at the Boney Springs site where squash seeds were dated at 1900 B.P. The next evidence of cultigens in the Plains comes with the appearance of corn, squash and possibly beans in several Kansas City Hopewell sites. One seed was recovered from the Trowbridge site and dated at A.D. 210±105 (Johnson 1972:69). Wedel (1943) reports charred beans and corn from the Renner site, although these disintegrated during excavation and were never positively indentified. Subsequent excavations at this site provided C-14 dates ranging from A.D 8±150 to A.D. 438±200 (Johnson 1979). Corn was also reported from this site by Roedl and Howard (1957).

Sites north of present day Kansas City belonging to the Steed-Kisker complex provide the next available evidence of tropical cultigens. Twelve-rowed ear corn was recovered from the Cloverdale site dated at A.D. 875±150 (Shippee 1972). Additional cultigens were recovered from other Steed-Kisker sites in the area, including Vandiver Mound and McClaron House sites. The first site, dated at A.D. 1290±80, yielded varieties of Northern Flint corn (Shippee 1972). House 1 at the McClaron site has provided a date of A.D. 1260±90. Preserved flora from three additional Steed-Kisker sites located within Smithville Lake provided evidence for a partial reliance on agricultrual foods. Sites 23CL226, 23CL274, and 23CL276 all yielded charred corn kernals of an unknown variety (McHugh 1980). While large-sized Iva annua achenes were also recovered from several of these sites, they are not conclusively considered to be of a cultivated variety. Also in the Smithville area and along the Platte and Little Platte Rivers are other sites which have supplied evidence of agriculture (Calabrese 1969; Wedel 1943). At the Friend and Foe site (23CL113) and the Steed-Kisker site (23PL13), small corn cobs and squash remains were recovered. Rind from a pumpkin (Cucurbita peop) was recovered from the Steed-Kisker site while seeds of this plant were preserved at the Friend and Foe site. Sunflower achenes found at the Steed-Kisker site may have been cultivated (Wedel 1943:71).

Charred corn kernels have also been recovered in eastern Kansas at the Hatcher site (14DP19), believed to date to A.D. 1C00-1500 (Johnson 1968).

The Two Deer site (14BU55) has provided evidence of the use of corn, squash and sunflowers (Adair and Brown 1981) and has been dated at A.D. 1000±25. Excavations of several Pomona focus sites in the Wolf Creek area of eastern Kansas provide additional evidence of agriculture. Both corn and beans were recovered from the Anderson site (14CF508) which dates from A.D. 1370±150 and A.D. 1495±145 (Rohn, Stein and Glover 1977).

Within the Little Blue River Valley, the evidence for agriculture is more limited than that for the area presented above. Although a large number of sites in the valley have been intensively investigated only Seven Acres and Bowlin Bridge, both of which belong to the Mississippian period May Brook phase, have yielded evidence of charred corn. This meager sample cannot be considered conclusive evidence for agriculture since the indentification of corn from the Seven Acres site is inconclusive. The combined total for both sites is only four corn kernels.

Based on the above discussion, agriculture was not adopted by prehistoric groups in the Kansas City area until the Middle-Woodland period. However, the reliance on this form of subsistence appears to have been minimal. While agriculture increased in importance in the subsistence base during the Mississippian time period, the reliance in the Kansas City area was never as great as that observed in Mississippian sites to the east, such as at Cahokia. The important question, then is why was agriculture never an important part of the subsistence base of prehistoric occupants in the Kansas City area. The evidence from Phillips and Boney Springs indicates that cultigens, specifically squash and bottle gourd, were available to prehistoric groups in the area by at least 2000 years B.P. A sedentary lifestyle, which has been suggested as a requirement for agriculture, was adopted in the Kansas City area by Middle Woodland times (Reid 1980). In light of the preceeding discussion, and current theories concerning the origin of argiculture, several possible explanations for this perplexing problem can be offered. Cohen's (1977) population stress, one of the current theories, states that gradual increases in prehistoric populations, beginning as early as the Paleo-Indian period, placed ever-increasing demands on the environment. As populations grew and potential for territorial expansion was exhausted, attention may have been directed toward the domestication of less desirable foods (such as small seeded plants, tubers, cultigens) in an effort to increase the total food supply and edible calories available (Cohen 1977). As suggested earlier, a sedentary lifestyle may have provided the potential for population increase, even without an agricultural subsistence base (Lee 1968). If so, the population increase could not only have preceded the adoption of agriculture but may actually have necessitated the change.

However, agriculture may not have been the only alternative available for increasing the food supply in a densely populated area. As a part of the settlement-subsistence pattern for Kansas City Hopewell, it has been suggested that small ancillary camps, perhaps seasonal in occupation, functioned as suppliers of resources to larger, more permanently occupied villages (Johnson 1976). The establishment of ancillary maintenance camps may be viewed as one

method of increasing food supplies. This suggestion is further supported by the indication that the smaller camps were established late in the Kansas City Hopewell cultural sequence (Johnson 1974), possibly after the larger sedentary villages had increased sufficiently in numbers to the point where the immediate environment could no longer support them. This adaptation may have been a more effective or efficient means of increasing food supplies than was agriculture. If so, the posited increase in population may have been accommodated without a change in the subsistence base.

A second possible explanation for the lack of evidence for agriculture in the Kansas City area is based on the presence of a well developed, efficient exploitation of subsistence resources. Following Caldwell's (1958) suggestion, agriculture was not adopted because the existing means of resource exploitation fit the economic requirements quite efficiently. Caldwell terms this successful adjustment to the forest environment "primary forest efficiency".

The occurrence of such an efficient well-adapted pattern of resource exploitation is observable in the archaeological record of the Little Blue River Valley during the Early Woodland at the Traff site (Adair 1980). While the Kansas City Hopewell subsistence pattern differs from this pattern, research indicates that a well-developed seasonal pattern of resource exploitation is characterized in this cultural period (Adair 1977, E. Johnson 1973). The scheduling of prime, seasonally available foods is often viewed as one of the more efficient collection patterns (Flannery 1968) and one which can incorporate agricultural foods without major readjustments. Floral and faunal evidence from the Kansas City area in general (Root 1979; Adair 1977; Johnson 1973; Artz 1979; Wedel 1943; Shippee 1972) and from the Little Blue River Valley (Adair 1980; Brown and Zeigler 1979; Reeder 1979; Schmits 1980; Wright 1980) suggests that the hunting and gathering regime was a highly successful and stable system that survived possibly into the historic era. If population pressures could be dealt with in the manner suggested above, with the adoption of agriculture viewed as one of several alternatives, it is possible that agriculture was not adopted by prehistoric occupants of the Little Blue Valley simply because it was not needed.

LITHIC RESOURCE UTILIZATION

By virtue of their durability, lithic artifacts are often the major source of data through which anthropologists discern exchange patterns, settlement patterns and even prehistoric economic and political systems. Because of this it is important that they be understood for their natural internal variability and source locations. The need to control these variables has long been recognized but until recently the only local attempt to do so was a study of the distribution and characteristics of Kansas City area cherts in Clay County, Missouri (Reid 1977, 1980). One goal of the Little Blue Lakes project was to examine the variability in cherts for the Little Blue River drainage, as well as to determine the extent of utilization by its inhabitants of non-local materials including chert, hematite and glacial erratics.

There are three chert bearing limestones in the study area: Winterset, Westerville and Argentine. Of these Winterset is the most locally abundant and easiest to locate due to its stratigraphic position just above the conspicuous outcropping of Bethany Falls limestone. The chert is of generally good quality and occurs in bedrock, weathered regoliths and secondary alluvial deposits throughout the valley. Important dimensions of the internal characteristics of Winterset were revealed during the project. Winterset occurs in massive blue tabular layers and brown tabular chunks and nodules. Brown Winterset is usually located lower in the cross-section of Winterset formation and more frequently outcrops in the Longview Lake area. Blue Winterset chert is located in the upper portions of the formation in both lake areas. Brown Winterset has a smooth, lustruous appearence and a varied mottled to homogeneous internal structure. Blue Winterset is often riddled with calcite veins and laminae and is somewhat more difficult to flake than the brown.

Brown Winterset is similar to descriptions of Westerville chert from Clay County, Missouri. Until now, it was assumed that the internal characteristics of Winterset were restricted to those of the blue variety. Because of this and the fact that no chert-bearing Westerville limestone had been found in the study area, virtually all brown cherts found at sites in this area were thought to be imported Westerville chert. For example, test investigations at 23JA170 in Longview Lake (Brown 1976) reported that Westerville chert accounted for 52 percent of the chipped stone debitage and 60 percent of the point samples (Brown 1976:7506). However, Phase III investigations at 23JA170 indicated that the points were 29 percent Westerville, 40 percent Winterset (brown and blue), 10 percent exotic or unknown and 5.2 percent Argentine. For other classes of chipped-stone products and by-products Winterset represents the overwhelming majority among raw material classes. A similar reversal of specific raw material utilization at 23JA35 was also noted. Most of the points, other bifacial tools and debitage were variants of the local Winterset chert. At the Sohn site (23JA110), near Longview Lake and 23J170, early estimates indicated that Westerville or Spring Hill cherts accounted for 30 percent of the 56 points from its Late Archaic component. These cherts are located 65 km north of the site (Reid 1980:38). Considering the recently discovered similarities between local brown Winterset and Clay County Westerville, it is possible that this estimate is too high.

The results of the present investigations indicate that Westerville chert is not present in the Little Blue drainage. Argentine chert does occur, but in minor frequencies. Its parent limestone is high on the stratigraphic column and, in the Little Blue drainage, its remnants occur only in the few scattered patches of upland prairies. Secondary deposits of Argentine have been located in the south and southeastern portions of the valley.

In terms of chipped-stone raw materials, procurement focused on the locally abundant blue and tan Winterset chert of the Little Blue drainage. In both Longview and Blue Springs this chert occurs at low elevations relative to the valley floors usually in near-surface beds and regoliths, secondary slopes and alluvial deposits. These factors, as well as its overall suitability for

tool production, are probably the major reasons for its popularity in the chipped-stone industry.

Similar reliance on locally available materials may be seen for the groundstone industries. The Little Blue drainage was not glaciated as were adjacent areas to the north such as Clay and Platte Counties. Consequently, the low frequency of manos, metates, adzes or axes made from erratics such as quartzite gabbro and granite probably indicate a preference for functional equivalents made from other locally available materials such as chert. It is probable that many perishable materials such as wood were also used as substitutes.

Non-local sources of chert found in sites in the project area are from Mississippian system formation in southern and central Missouri. These included white Burlington chert, oolithic Jefferson City chert and olive-brown Plattsmouth chert with numerous white fusilinid fossils. The frequencies of these cherts among lithic assemblages is characteristically low, especially among production debris. When they do occur it is usually in the form of finished projectile points and small flake tools. During the Middle Woodland period, the frequencies of non-local cherts rises for light-duty tools while the production debris still reflects intense utilization of local cherts. A high percentage of non-local white cherts is found in May Brook phase sites.

The procurement and utilization of hematite and limonite may have required a variety of strategies. It is known that limonite occurs as surface deposits from Winterset limestone regoliths in the upper Little Blue Valley in southern Jackson County. Limonite is also seen in Kansas City Group shales and as a cementing agent in glacial tills north of the Missouri River. Limonite occurs locally as a soft matte-textured yellowish-red variety found in the area limestone. Hematite is a hard, metallic mineral whose nearest known sources include the headwaters of the Pomme de Terre Valley and glacial tills and beds in north central Missouri.

CULTURAL ADAPTATION IN THE LITTLE BLUE VALLEY

The cultural sequence we have outlined for the Little Blue Valley indicates intensive occupation of this region from the Late Archaic (ca. 2600 B.C.) to the Mississippian Period (ca. A.D. 1300). Through time, settlement patterns included seasonal and year round campsites of small and large groups of people. The pattern which seems to have persisted during Archaic through Mississippian times is one of seasonal occupation of valley bottoms by relatively small dispersed groups. Throughout this period, subsistence continued to be maintained through the hunting and gathering of resources from the mixed prairie/oak-hickory forest. The result of these efforts included protein rich deer, and mast products supplemented by ruderals. Riverine resources (eg. fish) and tropical cultigens were utilized only to a limited extent. The majority of food resources were a result of the natural productivity of the local woodland environment.

Subsistence technology in the area remains fairly stable throughout most of the known prehistoric sequences. The best evidence for this stability is in the form of lithic implements. The "early" dominant bifacial tools include heavy and light-duty forms, the latter, consisting of knives and dart points. Other tools are primarily utilized and unifacially retouched flakes. This technology is present from Late Archaic through Middle Woodland times. At about A.D. 500, small corner-notched points, probably arrow armaments, replaced the larger forms. This technological shift is important for the lithic industries but it may not have had a great impact on hunting strategies.

Resource availability in the Little Blue Valley is diverse and abundant but susceptible to minor climatic changes. Subsistence, gained from the natural productivity of the mixed prairire/oak-hickory forest, was probably influenced by yearly fluctuations in the distribution of suitable stands of mast products and associated fauna. Therefore, adequate supplies of nutritionally important foods could have been assured by group mobility. In general, the variety of edge-environments offered by the mixed/prairie-forest contained adequate supplies of food. Lithic resources were also abundant in the form of Winterset, Westerville, Argentine and possibly Spring Hill chert. Of these, Winterset chert was most extensively utilized in the Little Blue Valley because of its good quality, abundance and accessiblity at bedded, regolithic and secondary deposits on valley side slopes and floors.

This summary of the variability for three major subsistence related practices used in Kansas City area for 4500 years indicates the maintenance of a hunter-gatherer based economy in a relatively stable mixed prairie/forest environment. Variability is present in the form of settlement types. The most persistent type is the seasonally occupied upland site during the Late Archaic (ca. 4500-2000 B.C.).

The maintenance of the hunting gathering subsistence base over a long period of time probably had its greatest effects on the social structures of the area's inhabitants, particularly the organization of individual settlements. As discussed above, the advantages of mobility and dispersal or aggregation were probably instrumental in assuring adequate subsistence without relying on food production such as horticulture or agriculture. The processes of implementation of the different settlement types necessitated a degree of flexibility within various levels of group interaction. For example, the seasonally dispersed-aggregated pattern suggested for the Late Archaic would have required that the structure of the smaller group be compatible with that of the seasonal gathering of several such groups. The large permanent settlements of Kansas City Hopewell villages located to the north of the Little Blue Valley indicates a more complex social relations necessary to maintain the internal village affairs as well as extra-village relationships. Since the Hopewell village co-existed with other Middle Woodland settlements of different sizes and duration of occupation, an additional dimension is added to this structure of social relationships which may or may not have been compatible.

The settlement patterns for subsequent Late Woodland and Mississippian periods in the Little Blue Valley appear to be seasonally occupied valley settlements established by small groups. The absence of permanent village aggregates indicates the disappearance of more structured organization and the continuance of a long established set of traditions regarding group interaction.

These forms of hunter-gatherer cultural adaptations in the Little Blue Valley imply that its existence was predicated on relatively flexible settlement policies and social relationships. Thus, it is difficult to imagine at any time the presence of a level of social organization more complex than the band level.

The model outlined above for cultural adaptation in the Little Blue Valley emphasizes the preservation of a long established subsistence tradition which was successful because of decisions to vary settlement composition and location (hence, social structure) rather than the subsistence base. It is one illustration of what may be termed "cultural conservatism" in that particular long standing facets of cultural relationships and adaptations were promoted over other alternatives. In the Little Blue Valley, the policies involved in hunting and gathering were probably better preserved than any other aspect of social relationships.

"Cultural conservatism" has been noted elsewhere in anthropological studies. Taylor (1964) and Alexander (1970) note that, among Coahuila hunter-gatherers, use of particular waterholes and adjacent food resources was restricted to the membership of specific living groups. By a pattern which he refers to as "tethered nomadism", adequate water and food supplies were guaranteed for all in this fashion. At the same time cultural interaction between these groups was restricted. The conservative effect in this case is reflected in a relatively rigid adherence to a particular group of people. Cultural conservation in the Little Blue Valley implies then, the presence of a stable economy rather than the presence of specific social structures over a long period of time.

RECOMMENDATIONS FOR MANAGEMENT OF CULTURAL RESOURCES IN BLUE SPRINGS AND LONGVIEW PROJECT AREAS

Archaeological resources are a scarce, fragile commodity constantly being depleted by industrial and urban expansion. Although it is difficult to refer to any archaeological manifestation as insignificant, it is necessary to make judgments regarding the significance of sites in terms of he expected return for effort spent in obtaining data. The site must be viewed in relation to the existing data base for the area and whether the information available at a site justifies the effort required to extract it, or whether that effort might better be expended on some other site.

Objectivity can be introduced into the process of judging a site's significance by examining the factors regarding the phsyical characteristics of the site, such as its degree of disturbance or the presence or absence of features in terms of a ranking scale (c.f. Henry 1978). The consideration of each factor separately and the documentation of the factors considered allows the archaeologist to provide a more objective basis for his evaluation and gives contracting and reviewing agencies a better idea of the process used to make the determination.

In making recommendations for the sites tested in 1979, four basic criteria were utilized. These were: (1) physical condition of the site, (2) the site content, (3) its relationship to regional research questions and (4) the expected impact of dam construction and related activities on the site. The first three were used to evaluate the potential of the site in answering questions pertinent to the archaeology of the region and the fourth was used in the process of making recommendations for the site.

Site condition is based on the amount and nature of post-depositional disturbance. Factors such as plowing, construction activities, road building and natural erosion are taken into account. The site content is based on the archaeological features or remains which have been recorded or which can be expected to be present given the erosional and depositional conditions at the site. The site content includes such things as the presence or absence of a surface distribution, preservation of subsurface cultural deposits or features and the likelihood of recovering datable carbon, faunal or botanical remains or diagnostic artifacts. These factors and others were examined to determine what materials a future researcher might have to work with in further evaluation of the site. The knowledge gained so far about the particular site was then examined in relation to the present data base regarding past human events in the area.

These three major factors taken together were used in making a judgment as to the relative significance of a particular site. In the case of site judged not significant no further work is recommended. This does not mean the site was of no interest as an archaeological manifestation but rather that further work would be unlikely to increase the data base already collected in survey and testing. Destruction of these sites will, therefore, not seriously affect the data base for the region, provided they have been adequately documented.

In the case of a site judged to be significant as a result of testing there are then a limited number of options for mitigation. The preferred option is preservation (Wendorf 1978; King 1975) and in cases where this appears feasible it has been recommended. Preservation can include anything from simply withholding site location information to active protection of the site, dependent on the anticipated utilization of the area. Sites preserved because of their significance should be formally nominated to the National Register of Historic Places. The other option, in cases where planned activities will destroy or seriously endanger the site, is data recovery. The form

this excavation will take is dependent on the nature of the site and the research questions to be addressed. It could range from a controlled surface collection to a major block excavation. For some sites we have suggested research questions and mitigation options but these must be viewed as starting points only. The orientations and knowledge of future researchers must guide the final mitigation plans.

It is recommended that no further work be conducted at eight sites in the Blue Springs Lake area (23JA109, 23JA137, 23JA158, 23JA162, 23JA163, 23JA164, 23JA165 and 23JA166) and at eleven sites in the Longview Lake area (23JA168, 23JA169, 23JA171, 23JA172, 23JA173, 23JA174, 23JA175, 23JA176, 23JA177, 23JA183 and 23JA184). Decisions for these recommendations followed from the criteria discussed above. Each of these sites is characterized by particularly low artifact yields and absence of cultural features. Culturally diagnostic artifacts were recovered at only nine sites. Construction damage destroyed the integrity of cultural deposits at 23JA109. At 23JA153 it was determined that the few cultural materials were redeposited from some unknown location.

Important and better preserved data was recovered from nine sites and these sites were consequently recommended for mitigative action. Options for preservation are recommended for sites 23JA160, 23JA161 and 23JA182 in the Blue Springs Lake area and 23JA181 in the Longview Lake area. Site 23JA160 is an upland occupation overlooking the East Fork of the Little Blue River. The artifact assemblage came from a good depositional context and included a Dalton-like point, indicating a possible Early Archaic occupation. Early Archaic sites are poorly known for the region, thus 23JA160 is significant in terms of expanding our data base for the Archaic period. The site, however, is not in direct danger of inundation or construction. Since the area will be open to public use, secondary impact in the form of vandalism may occur. It is recommended that the site be preserved or, if this is not possible, that additional archaeological investigations be conducted.

Site 23JA161 is also an upland site and, like 23JA160, may represent an Early Archaic occupation. The cultural deposit is relatively dense and would provide data necessary for settlement-subsistence studies of the Archaic period. The site is within proposed picnic, parking and road areas and it is recommended that the site should be allowed to grow in natural vegetation in order to protect it from vandalism. If preservation is not possible, steps should be taken to excavate. Acorn Shelter (23JA182) is one of few rock shelters in the area. It contains a substantial Late Archaic occupation which may be related to 23JA155. Its location above the flood pool puts it out of direct danger of inundation but its proximity to public use areas requires that it be protected from public view. In particular, a proposed public trail should be aligned so as to divert visitation away from the shelter. If this is not possible, additional mitigative excavations should be conducted.

The last site recommended for preservation is site 23JA181, located in Longview Lake on a bluff slope about 50 m south of the Little Blue River. The

cultural deposits are dense and represent Early Archaic and Woodland occupations. Preservation of the site is recommended since no developments are planned for the area. If this is not possible, excavations should be conducted in order to obtain in situ cultural materials and datable carbon samples.

Five sites in the Little Blue Lakes project area contain particularly valuable information and the likelihood of either direct or secondary impact is great. Sites 23JA9 and 23JA37 are both rock shelters in the Blue Springs Lake area. Neither are in danger of inundation but their proximity to public use areas increases the risk of public visitation and destruction by vandals. Both sites contain well preserved cultural deposits representing multiple occupations. At 23JA9, Middle Woodland through Mississippian (May Brook phase) deposits are present. The May Brook phase is particularly important since this aspect of the Mississippian period has only recently been documented. The rock shelter at 23JA37 contains Late Archaic and Woodland deposits as well as data pertinent to subsistence related studies. Since these rock shelters are two of three such sites known for the region it is recommended that their contents be documented through extensive excavations, although mitigation by preservation is preferred if such preservation can be assured.

Black Belly (23JA38) is recommended for extensive excavation for the following reasons. In addition to its Middle Woodland component, the site contains a stratigraphically distinct May Brook phase occupation. Both components have intact, undisturbed buried deposits which contain features and organic materials suitable for establishing duration and season of occupancy. As we have previously noted, Middle Woodland settlement subsistence patterns are not well understood for the Little Blue Valley. The May Brook phase has only recently been defined and much remains to be learned about the internal structure of these sites and the relationship between May Brook and neighboring Mississippian and Plains Village complexes. In addition, Black Belly is rapidly being damaged by stream erosion, and bank slumping and will be destroyed by inundation by the multipurpose pool area. Therefore, extensive excavation is recommended for this site.

Site 23JA143 also contains an intact subsurface deposit for the Middle Woodland period including floral and faunal remains. It is in direct danger of inundation and preservation is not a possible option. The site's significance is further illustrated by the fact that it yielded a radiocarbon date of A.D. 330, almost exactly the same as that obtained for the nearby Middle Woodland occupation at 23JA23, 750 meters east of 23JA143. The combined study of 23JA238 and 23JA143 should clarify the nature of Middle Woodland adaptations in the Little Blue Valley. Recovery of a large artifact sample from these sites should provide sufficient data to assess the relationship between the Little Blue Valley Middle Woodland sites and Kansas City Hopewell sites north of the Missouri River.

Site 23JA155 is the oldest securely dated occupation in the Kansas City area. It is a deeply buried terrace deposit with preserved floral and faunal samples. Its age, ca. 2400 B.C., makes it contemporaneous with Late Archaic Nebo Hill occupations, yet artifact styles are distinct from those of the Nebo Hill complex. Thus we are now faced with possibly two distinct contemporaneous Late Archaic phases. This site will be adversely affected by wave action when the lake is at multipurpose pool level although serious damage may occur at flood pool level. Appropriate mitigative action should be taken to preseive or to intensively study this site.

Mitigation in the form of excavation was conducted at five sites in the course of the Little Blue Lakes project. Two Late Archaic Nebo Hill phase sites were investigated. Site 23JA170 is a bluff-top site overlooking the Little Blue River in the Longview Lake area. It is a relatively large site with high densities of debris and tools as well as a strong index of Nebo Hill lanceolate points. No hearths or other features were encountered, but given the density of artifacts, it is likely that the site still contains intact deposits of cultural materials. Since the site area may encounter visitation during public use it is recommended that the area be allowed to grow up in natural vegetation for the purpose of preservation. The Turner-Casey site (23JA35) is a very large bluff-top Nebo Hill phase site representing the earliest westward extension of fiber tempered ceramics. A considerable amount of information remains to be collected from the site. Since the occupied area may be used as a borrow-pit for dam fill construction, it is recommended to (1) preserve representative areas of the site and (2) monitor mechanical stripping of borrow areas by a professional archaeologist for the recovery of tools and features.

Site 23JA112 and the Mouse Creek site (23JA104), located in Longview Lake, are valley bottom sites along the Little Blue River and Mouse Creek, respectively. Both contained the remnants of small seasonally occupied encampments of the Late Middle Woodland or Late Woodland periods. Excavation permitted recovery of suitable amounts of data for the determination of settlement and subsistence related practices for the Woodland period. No further work is recommended for these sites.

The Bowlin Bridge site (23JA38) was originally considered to be a Middle Woodland encampment. The present investigations revealed two temporally distinct occupations of the Early Woodland and Mississippian periods (May Brook phase). Analyses indicated that the nature of the occupations conformed to other sites of those time periods. Both are streamside short-term occupations related to exploitation of nearby food resources, perhaps on a seasonal basis. No further work is recommended for the Bowlin Bridge site.

GLOSSARY OF TECHNICAL TERMS

agriculture - Increased food supply beyond the natural food supply. Prehistorically, it is difficult to distinguish agriculture from horticulture. However, in historic times agriculture is usually indicated by intensification of horticulture technology by use of domesticated animals, irrigation systems and more complex machines such as plows.

artifact - An object of any type made by human hands. Tools, weapons, pottery, and sculptured and engraved objects are representative artifacts.

assemblage - A group of industries found in an archaelogical site.

atlatl - A device which makes it possible to throw a spear farther and with greater speed than possible with the arm only.

attribute - A distinct feature of an artifact that connot be divided into additonal units of a similar kind, e.g., temper is a ceramic attribute.

awl - A pointed bone or antler tool used in the manufacture of skin items and clothing.

bifacial - Deliberate alteration upon two opposite surfaces of a stone tool.

body sherd - Fragment from the lower portion of a ceramic vessel.

celt - An ungrooved axe head made of a hard metal, ground or chipped-stone. The term is also used for adze. The celt was mounted on a staff or shaft of wood or was attached by a thong to a handle.

chert - Any of various microscopically crystalline mineral varieties of silica. In the Kansas City locality, chert occurs in several limestone members and used as the preferred raw material for the local chipped-stone industries because of its workability and conchoidal fracture.

collard rim - Technological and stylistic motif in ceramic manufacture consisting of a horizontal addition of clay to the neck of the vessel.

complex - A related group of traits in a given culture area or locality, e.g., Nebo Hill complex of the Kansas City locality.

component - A zone in an archaeological site grouped into a phase with similar assemblages in the same locale and of the same time period.

conchoidal fracture - Clam-like, curved surfaces with ripple marks formed under certain kinds of rock breakage; it is the characteristic breakage pattern of chert when directed blows are applied to produce flakes, blades or for the shaping of chipped-stone tools.

cordmarking - A pottery decoration produced by pressing the vessel surface with a cord-wrapped tool when the clay is still malleable.

cultural resources management - Knowledgeable investigation, preservation and public dissemination of information relating to prehistortic and historic artifacts, habitations and archaeological sites.

culture - Man's extrasomatic means of adaptation. It is the transference of technology, social organization and ideology by non-biological means.

diagnostic artifact - Material remnant of an historic or prehistoric technology that provides a temporal and cultural association, which has been determined by previous scientific investigations.

fluted - Term which refers to a stone tool manufacturing technique associated with Paleo-Indian period and consists of relatively long parallel-sided scars on tools surfaces.

grab sample - A sample of artifacts recovered from the general provenience of the site rather than individually mapped or collected by grid quadrants.

grit timpering - Temper consisting of crushed particles of rock such as limestone, chert or granite.

ground stone - Term referring to method of stone tool manufacture consisting of grinding and polishing in order to produce the desired shape.

hammerstone - Usually a modified or unmodified pebble or cobble used as a hammer.

hematite - A blackish-red or brick-red mineral, essentially Fe_2O_3, the chief ore of iron. Hematite served largely as a pigmenting substance for aesthetic purposes in prehistoric and historic times, but large dense pieces were sometimes selected to be formed into tools.

horticulture - Hand tillage of the soil, using such implements as the hoe or digging stick. Production of food using horticulture does not require the use of draught animal or machines.

industry - Artifact types involved with a specific function, e.g., a grinding tool industry.

in situ - Term referring to an intact position of an artifact within the matrix in which it was originally deposited.

mano - A hand stone that has been shaped for use as a grinding stone in connection with a metate. It is associated with the processing of vegetable matter.

metate - A flat stone upon which seeds and other foods are mashed and ground.

monitor - Supervision of earth alteration activities by qualified archaeologists to insure that cultural deposits are not destroyed by such activities.

National Register of Historic Places - Official list of the nations's cultural resources worthy of preservation.

pestle - An implement used to pulverize materials in a mortar.

phase - A cultural complex possessing traits sufficiently characteristic to distinguish it for purposes of preliminary classification, from earlier and later manifestations of the cultural development of which if formed a part, and from contemporaneous complexes. For example, the Steed-Kisker and May Brook phases are approximately contemporaneous, yet materially distinct phases of the Mississippian period in the Kansas City locality.

radiocarbon dating - The analysis of radioactive carbon (C-14) in archaeological samples to help date the remains. The method is especially useful in dating materials originating within the last 20,000 to 30,000 years. It is important that unaltered organic materials be used.

sedimentation - The natural process of soil accumulation derived from alluvial (riverine) or colluvial (mass earth movement) processes.

stratigraphy - The study of stratification and the results of those studies; a sequence of definable strata.

technology - All the means used to provide items necessary for human survival and comfort: tools, weapons, technical knowledge, resources that serve as instruments rather than subjects of labor.

tempering - The hardening and control of ceramic malleability by the addition of grass, sand, lime, crushed sherds and feldspar to the clay paste.

terrace - Bench-like features found along valley sides; the remnants of former valley bottoms left behind as the stream continued downcutting.

tradition - Temporal continuity represented by persistent configurations in single technologies or other systems of related forms.

type - A category of things, processes, or causes.

typology - The procedure of establishing and using archaeological types; an established system of types.

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